AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

DECEMBER, 1957

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Precision Metal Molding

PMM

INCLUDING DIE CASTINGS MAGAZINE

DIE CASTINGS

INVESTMENT CASTINGS

PERMANENT MOLD CASTINGS

PLASTER MOLD CASTINGS

POWDER METALLURGY

SHELL MOLD CASTINGS

To cut costs as low as possible, the *Chlonnet* is made almost entirely of aluminum die castings. *see page 3*

Certified ZAMAK

ZINC BASE DIE CASTING ALLOYS

CERTIFIED uniform high-quality ingot can help you make better castings at high production speeds.

- All ingot is production controlled under the most modern methods to insure purity.
- Alloys are metallurgically checked to assure ingot meets your specifications.
- All shipments are palletized and shipped with a certificate of analysis.

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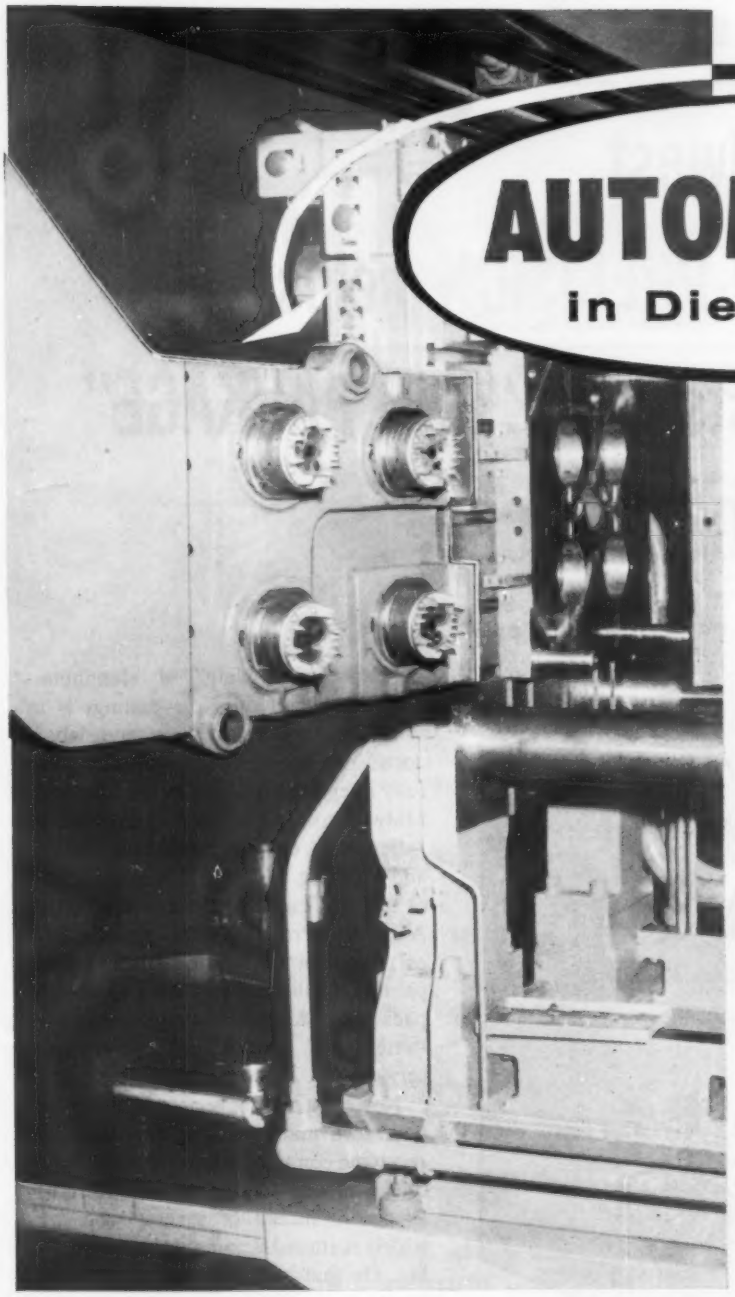


AUTOMATION
in Die Casting

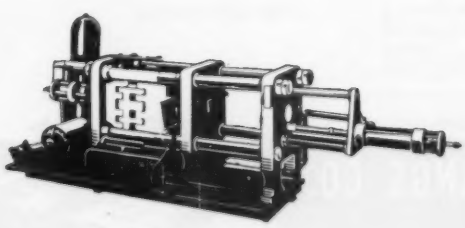
NEW! MULTIPLE CAVITY LOADER-UNLOADER

- Loads Laminations
- Die Casts
- Trims
- Unloads 4 rotors automatically

Another illustration of the pace-setting advances that are coming from Cast-Master! A major motor manufacturer gave Cast-Master the job of stepping up production and reducing labor on die-casting laminated rotors. Cast-Master solved the problem with this new, automatic loader-unloader. "Hydraulic muscles" load, trim, press out dummy shafts, unload automatically — cut costs while maintaining uniform quality. **One more example of the skill and know-how at your disposal when you turn your problems over to Cast-Master.**

FULLY DETAILED BROCHURE

Just off the press. Illustrated brochure giving complete details on this new CAST-MASTER loader-unloader. Phone, write or wire, and we'll get a copy to you at once.



Eastern Rep. Milton Harmon, 18 Rock Rd., Milford, Connecticut
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CAST-MASTER *Inc.*

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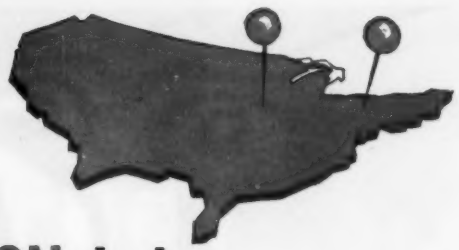
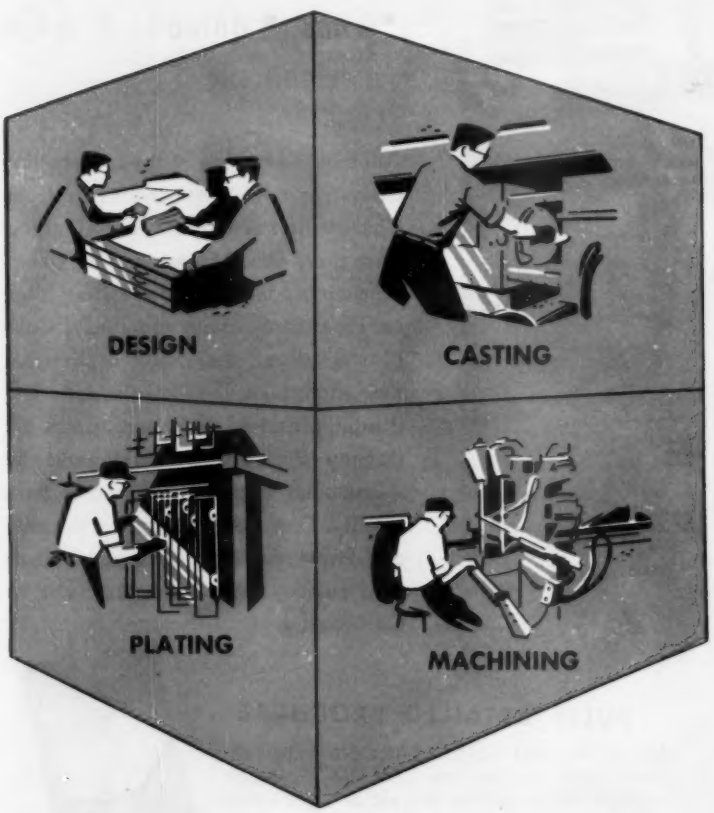


East or Midwest, AINSWORTH-PRECISION helps you cut costs with "ONE PACKAGE" DIE CASTING SERVICE



"Packaged Buying" of aluminum, zinc and magnesium die castings is a short-cut to reduced time and labor costs. You need only one supplier with fully integrated facilities in the East and Midwest to supply you with everything —die design, casting, machining, plating and finishing.

Among custom die casters, only Ainsworth-Precision offers you the finest, modern automated plating and painting facilities. From design through packaging, Ainsworth-Precision means "one-stop" economical die casting services.

Now, you can more accurately gauge your own manufacturing schedules by receiving completely finished parts from one source. Choosing Ainsworth-Precision instead of several who are widely scattered is common-sense thinking. On that next job, call our nearest plant or sales office.

AINSWORTH-PRECISION CASTINGS CO.

DIVISION OF HARSCO CORPORATION

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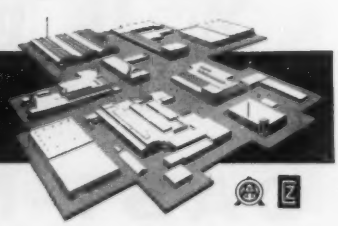

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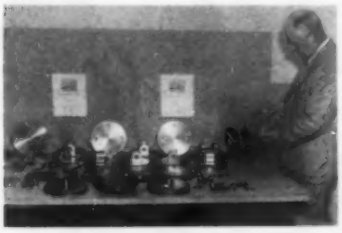
COVER STORY



KEEPING COSTS LOW as possible was the reason why the "Chlorinet" was designed by Wallace and Tiernan, Inc., to be made almost entirely of aluminum die castings. There is a total of five castings included in the unit. "Chlorinets" are small hypochlorinators which purify water. For facts on cutting costs in their manufacture, turn to page 40.

FEATURE ARTICLES

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One of America's best informed industrialists writes his predictions of things to come, some bad, some very good.

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By switching from a costly, nine-part assembly to a single piece investment casting, a firm saved time and money.

37 **CASTING STAINLESS STEEL AIRCRAFT PARTS**
Shell mold castings made in stainless steel are produced at close tolerances in this foundry.

38 **INTRODUCING COMMERCIAL TITANIUM POWDER**
Two excellent photographs alone make this story worth reading. One shows the granular structure of the powder itself.

40 **DESIGNING FOR ALUMINUM DIE CASTINGS**
Here's how a company was able to manufacture an item at low cost by designing parts as die castings.

42 **PROBING REVEALS HIDDEN COST CUTS**
At first glance, cost of producing investment cast parts may seem expensive. But a closer look often pays off.

44 **VACUUM SINTERING, PART III**
The last in the series of three technical articles on the important subject of vacuum sintering.

47 **IS SPACE SCARCE? USE ZINC DIE CASTINGS!**
When space is at a premium it behooves the designer to keep tolerances low on small parts.

76 **PROPER TEMPERATURE CONTROL EQUIPMENT**
By using equipment designed for the specific purpose of controlling temperatures, the finest castings can be produced.

FINISHING SECTION

51 **CUT THE NUMBER OF FINISHING REJECTS IN HALF**
When the proper finishing equipment is installed, parts often improve in quality. This firm cut reject loss by 50%.

54 **HERE ARE ADVANTAGES OF CONVERSION COATINGS**
There is much to be gained by using conversion coatings properly. This article describes these benefits.

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BETWEEN THE LINES

the editor's viewpoint on articles in current and forthcoming issues

SEASON'S GREETINGS from the staff of PMM. Watch the first issue of the new year for our second annual die casting directory. It will list such things as: where to buy die castings; information on alloys, facilities, trade names, trademarks and all identifying marks used on castings. This is an issue you will want to keep for reference, all through 1958.

WHAT WILL HAPPEN in the next ten years? Forecasting is always difficult, but when predictions are based on long experience in the economics of the metals industries, their accuracy can be more or less accepted. A Republic Steel Executive writes in this issue of PMM, pointing out trends that will probably guide the growth of the precision casting industry for the next decade. Read his predictions on page 33.

NO REJECTS in more than 3000 stainless steel, shell mold castings is the record highlighted in the article on page 37. Use of thin shell molds for making these parts has practically eliminated machining operations on the castings. Much of this is due to porosity of the molds which allows gases to escape and results in a finer, more accurate part.

TITANIUM SINTERINGS are described in an extremely interesting article on page 38. Take a look at the dramatic picture of the part sintered from this important metal. Also on the page is a rare micro-photo of titanium granules enlarged many times.

BY DESIGNING A PRODUCT so that its original form is based on the economical use of die castings, a realistic estimate of sale price and production costs can be made. Find out how the manufacturer of a small water-purifier was able to save money on his manufacturing costs and speed up production by taking advantage of the characteristics of aluminum die castings, on page 40.

WESTERN EDITOR, Scholar Bangs scores again as he presents you with a very interesting story proving things are not what they seem. Plot of the yarn deals with a part which seemed too expensive to make as an investment casting *at first glance*. But investigation revealed hidden cost cuts which were impressive. Read the details on page 42.

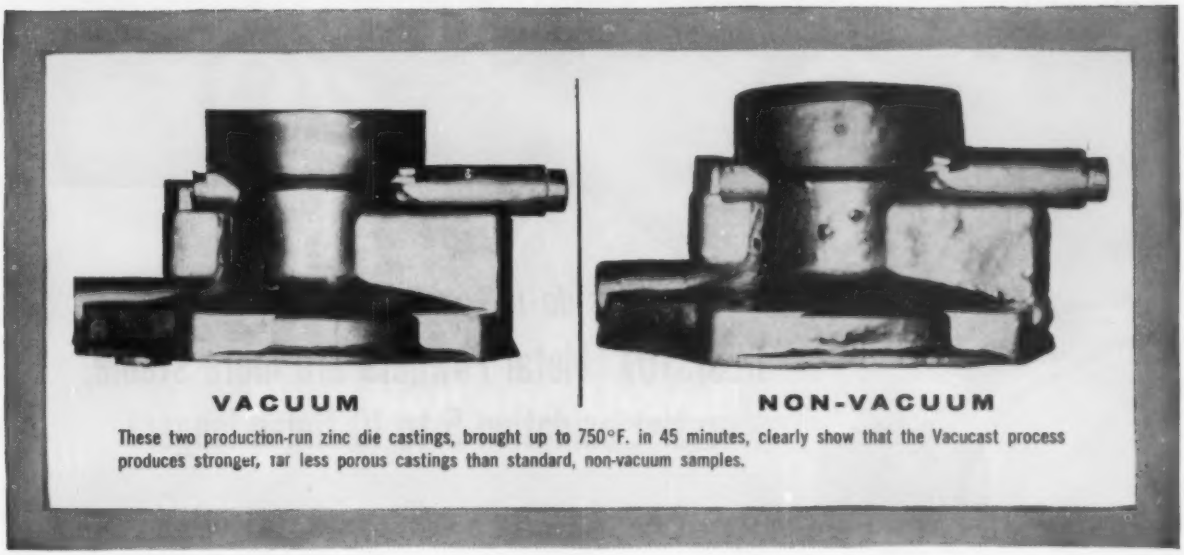
CAN YOU CUT FINISHING COSTS? Yes, according to the people at King-Seeley in Ann Arbor, Michigan, who installed an electro-static paint spray line. They carry parts through it on a conveyor system which is continuous. When they checked the benefits derived from the installation, they found that expenses for painting automotive parts produced by the company had been sliced in half. How? Get the facts on page 51.

COMPLICATED CHEMISTRY of conversion coatings is outlined in detail in a highly informative article beginning on page 54. Facts have been collected from many sources, then analyzed and listed in a clear, concise way. The result is an interesting story in which such things as rusting, and the application of chromate and phosphate coatings are revealed.

LOCATE THAT ARTICLE which appeared in an earlier issue. The one which can answer those design questions, or give you a lead on solutions to a finishing problem. Use the *Annual Editorial Directory*, beginning on page 81.

New Reed-Prentice Vacucast Process Gives

DENSER, STRONGER ZINC CASTINGS!



VACUUM NON-VACUUM

These two production-run zinc die castings, brought up to 750°F. in 45 minutes, clearly show that the Vacucast process produces stronger, far less porous castings than standard, non-vacuum samples.

Here's a big, new improvement in zinc die casting – the Reed-Prentice Vacucast system. Offered as original equipment *only* on REED die casters, this new vacuum casting process gives you higher quality castings than were ever possible before, and at a lower cost.

Exhaustive testing, conducted on Vacucast zinc castings by an independent testing laboratory, show the superiority of this new process. Here are some of the advantages you get with this new vacuum die casting operation:

- Up to 20% faster cycling
- Rejects cut by 50%
- Surface quality improvement greatly reduces polishing and buffing
- Increased hardness and strength, less permeability
- Porosity practically eliminated
- As much as .02" greater skin thickness in thin castings
- Big metal savings through permissible reduction in wall thickness
- Can use existing dies without alteration

ALUMINUM DIE CASTING TOO!

Now under final development and test – a new aluminum self-feeding Vacucast machine process. Watch for an announcement by Reed-Prentice for this newest engineering advancement.

To get complete information on the new Vacucast process, write today to Reed-Prentice Corp., 677 Cambridge Street, Worcester 4, Mass.

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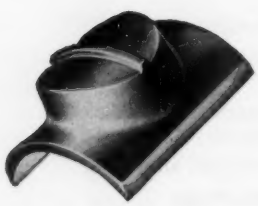
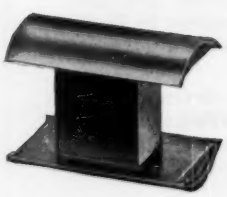
This do-it-yourself test proves

RESISTOX® Metal Powders are more stable, resist oxidation 5 to 10 times longer!

This test proves that the Resistox Process gives Glidden Metal Powders more stability through greater resistance to oxidation. You can store Glidden Resistox Metal Powders over long periods of time without fear of oxidation. And you can speed up production of metal parts, with less material-waste and die-wear, greatly improved finish, appearance, and performance characteristics.



In an open container, place a sample of Resistox copper or lead powder. In another, a like amount of an ordinary metal powder of the same type. Then wait . . . 3 days in hot humid weather, 2 weeks in cool dry weather. The striking difference in appearance that results (oxidation causes the ordinary metal powder to change color rapidly) will show comparative resistance to oxidation, prove superiority of Resistox Metal Powder.



Write for your free test-sample of Glidden Resistox Metal Powder (specify lead or copper) and complete information on these additional Glidden products: Cuprous Oxide, Cupric Oxide and Cubond (Copper Brazing Paste).

THE GLIDDEN COMPANY

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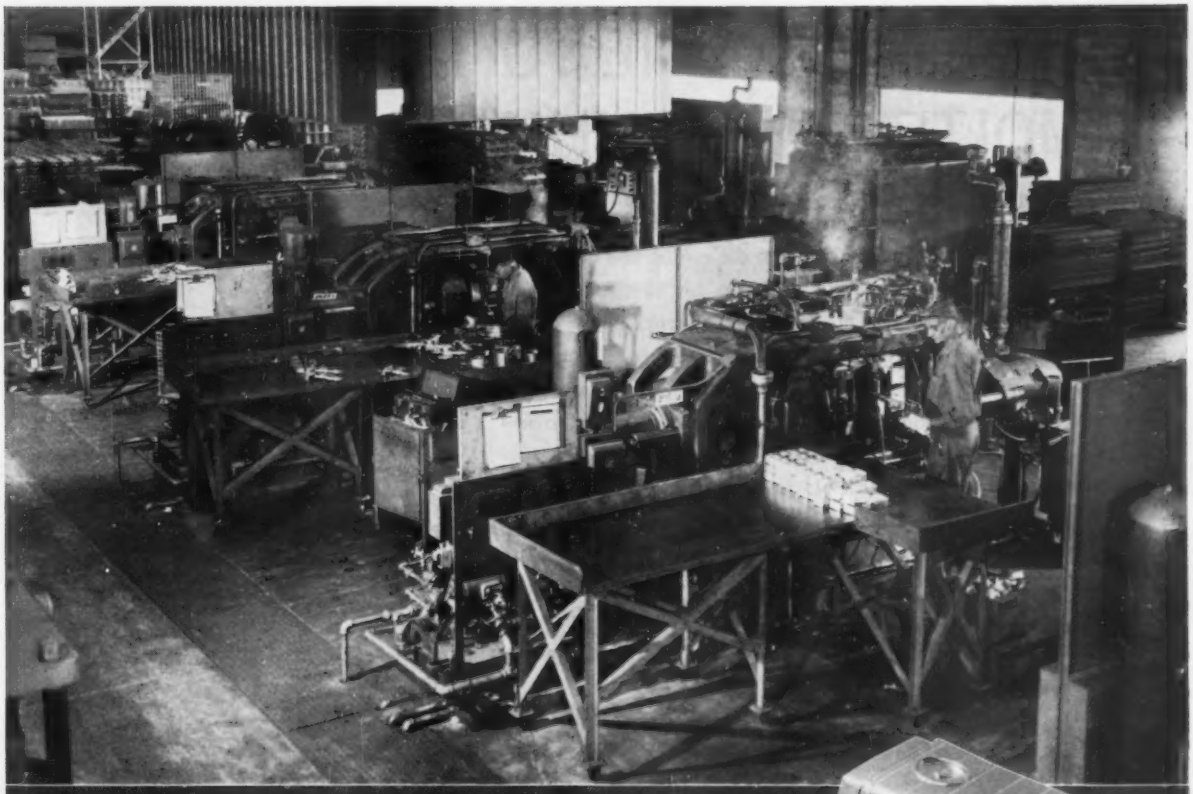

Now Bell and Howell... die casting on LESTERS...saves over 25% on this typical casting!

Bell and Howell Company, the only major photographic equipment manufacturer doing a major part of their own die casting, tell a story that is classic as a testimonial to the wisdom of installing Lester machines.

Mr. W. D. Johnson, Die Casting Manager of the company, has been working on the project since its inception, and was there when the first machines were installed—well over two years ago.

Speaking from this vantage point about the housing for their Monterey 8mm movie camera shown here, he says, "We had never done any die casting previous to our set-up of these machines a little over two years ago, and began production on this rather difficult casting on a high monthly requirement...This production schedule has continued since that time. *The savings to Bell and Howell on this particular casting have been well above the average savings of approximately 25% for the entire die casting operation.*"

●

Complete details on the full line of Lester Die Casting Machines are available in Bulletin 101. *Write for your copy TODAY.*

LESTER-PHOENIX, INC.

2708-S CHURCH AVENUE • CLEVELAND 13, OHIO

Agents in principal cities throughout the world

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These parts are IMMUNE TO MOLTEN ALUMINUM

Molten aluminum can't wet, can't harm the precision-formed parts shown here. These parts and fittings for aluminum die-casting and direct-chill castings are all made of REFRAX® silicon-nitride-bonded silicon carbide. They are Carborundum's answer to the need for a material that can be formed into intricate parts with outstanding corrosion resistance far above normal melting temperatures. REFRAX shapes are solving many problems in aluminum holding furnaces and aluminum alloying furnaces (including reverberatory and induction).

Consider the value of these other properties in your operation: Tolerances of ±.0005 in./in.; a modulus of rupture of 5600 psi at 2450°F (even the best heat resistant alloy melts below this temperature); and high heat conductivity that approaches that of chrome-nickel steel. Write today for product bulletin and technical articles on REFRAX materials. ***Refractories Division, The Carborundum Company, Perth Amboy, New Jersey, Dept. W127.***

CARBORUNDUM
Registered Trade Mark

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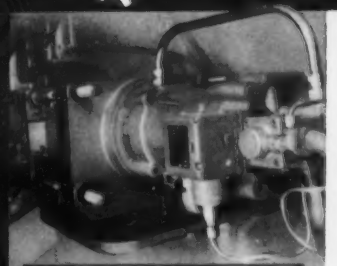
Introducing the machine that will revolutionize small parts diecasting!

The DCMT RAM AUTOMATIC

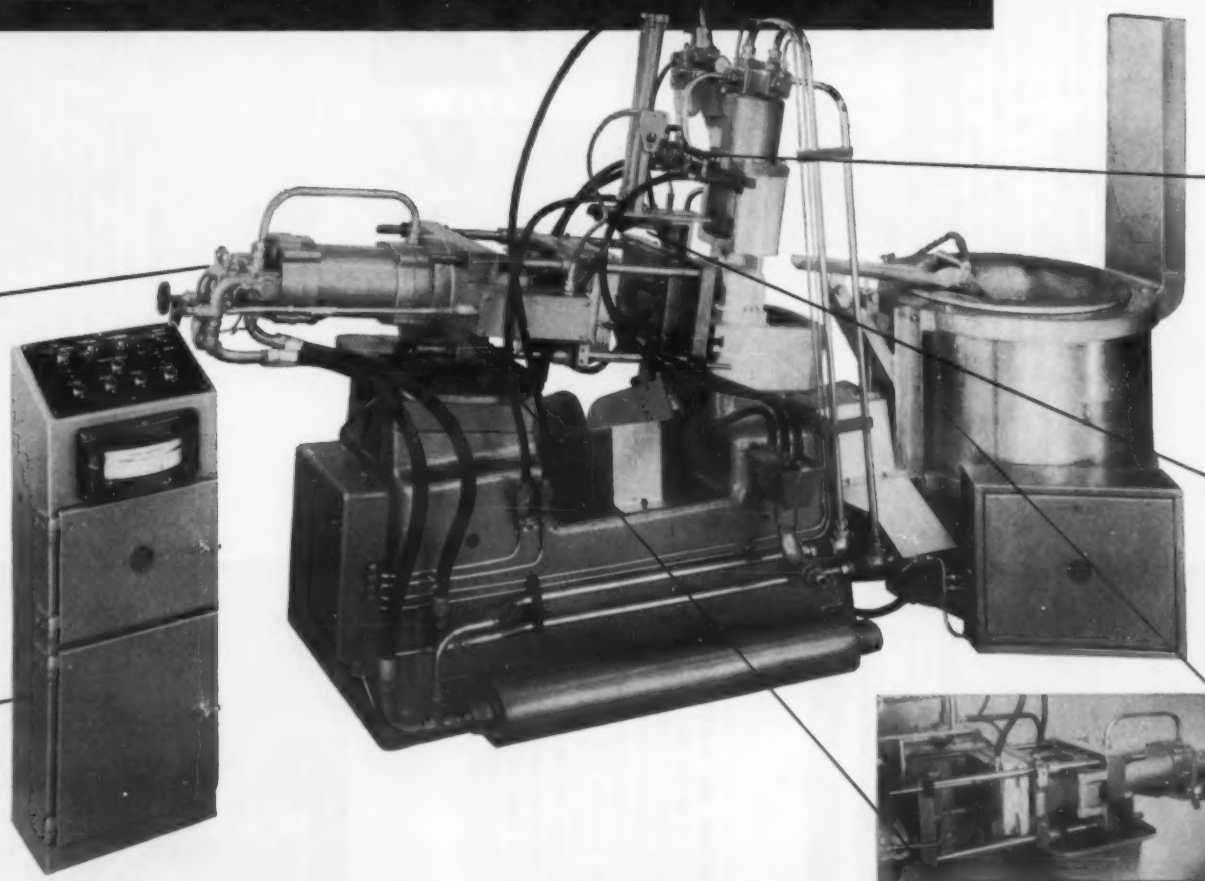
60 TON LOCK...1 LB. CAPACITY DIECASTING UNIT

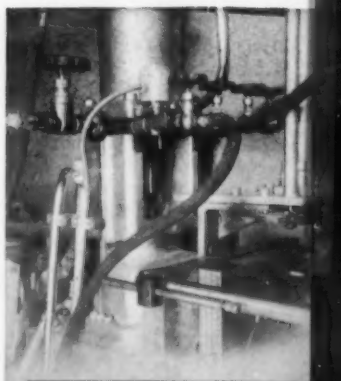
Requires no operator—reaches production averages up to 1500 shots per hour



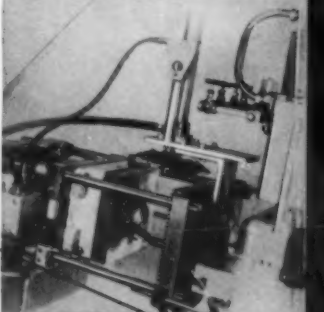
FLASH SENSING "DI-SAVER" SAFETY SYSTEM. This ultra sensitive pressure switch with infinite adjustment in series with a wide tolerance microswitch, can feel foreign matter between the dies as they lock up. Any unejected castings or other foreign matter will immediately cause the die to retract and stop the cycle! An additional pair of sensitive microswitches assures die lock at each corner, and prevents injection in case of flash or dirt causing the machine to recycle and reclean the dies.

SEPARATE ELECTRONIC PORTABLE CONTROL UNIT. Contains 3 sets of cycling controls, "Manual", "Single Cycle Automatic", and "Full Automatic". Timer panel plugs in for quick disconnect. All operating control boxes are mounted outside of machine base for easy maintenance. Machine can continue to be operated manually even when automatic timing controls are removed for maintenance.





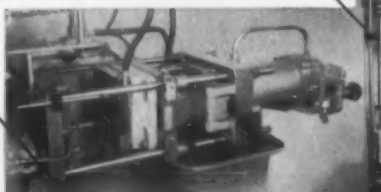
AUTOMATIC DIE TEMPERATURE CONTROL. Solenoid-operated thermostat automatically delivers the proper amount of water for die and sprue cooling to keep dies in proper thermal balance.



AUTOMATIC DIE CLEANING AND SELF-LUBRICATING MECHANISM. Tied into the machine cycle is a set of phosphor bronze brushes in adjustable segments to fit any die contour.

Brush wipes die on down stroke. Die is again wiped up on stroke.

Brush device can be set at any angle to miss core mechanisms, either or both die halves are automatically lubricated as dies start to close.



REMOVABLE DIE UNIT. For instant die changeover, all connections to the die unit are quick-disconnect couplings. Elimination of the major cause of machine "down time", whether it results from die changeover or maintenance, is accomplished by keeping one spare die unit with heat die mounted in place to service a bank of machines.

AUTOMATIC LADLING. When the pot level falls below a set height, the ladler is tripped automatically. Gently and without turbulence, it refills the machine pot from the preheat furnace. Ladle mechanism is made of a heat and corrosion resistant alloy which will not contaminate pot metal.

The only fully automatic small diecasting machine that produces "hardware finish" zinc castings up to 1 lb. at production averages often exceeding 1500 shots per hour! This remarkable new diecasting machine requires no operator.

For information, write Dept. DX367

DCMT SALES CORPORATION, PORT WASHINGTON, NEW YORK

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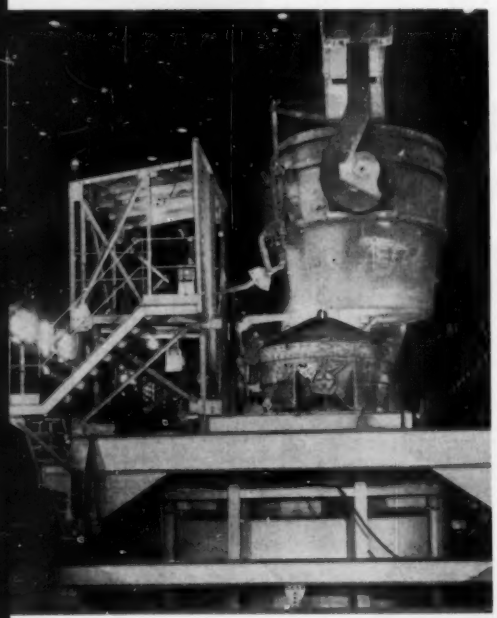
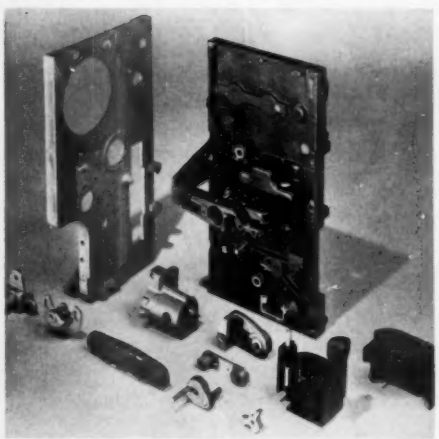


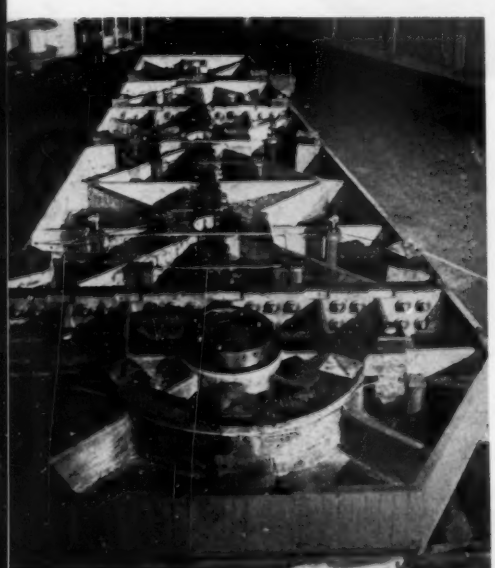
PMM CASTING ABOUT

technical news of applications & processes involving precision metal moldings

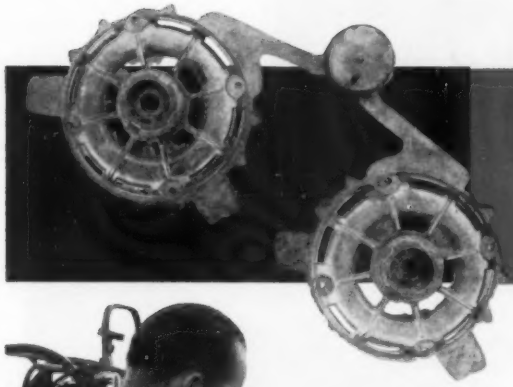
LARGE COMMERCIAL CASTINGS are now being produced at U.S. Steel's Duquesne Works at Duquesne, Pennsylvania, by a vacuum casting method which extracts harmful gases from the molten metal before the ingot is formed. This is expected to increase ductility in forgings and remove their sensitivity to internal ruptures. In order to accomplish this, a giant vessel 17 feet in diameter and 30 feet high is placed over the ingot mold and four large pumps remove air from the covering vessel. Ingots weighing up to 300,000 lbs. can be cast in this way. This new process will be used for high-grade steel products where trapped gases have a detrimental effect on the finished forging, such as large bearings for the ship building industry.

MAGNESIUM DIE CASTINGS figure prominently in the new RCA #400 Jr. motion picture projector, at right. Larger magnesium die castings, at left, can be easily identified on the projector. Smaller castings are inner, operating parts for inside assemblies. All are complex in shape and thus simplify manufacture of the projector by reducing the number of necessary parts to a minimum. Because magnesium parts were selected, the projector weighs 33½ lbs.





FOUR ALUMINUM SAND CASTINGS making up the largest aluminum sand casting assembly ever made, were recently installed in the heavy machining department of North American Aviation, Inc., in Columbus, Ohio. The sections were made in the Cleveland, Ohio, sand foundries of the Aluminum Company of America for forming part of a wing fabrication table which will hold a wing panel for precision milling. All four parts measure 28 feet in length, 130 inches wide, and 16 inches deep. The heaviest section weighs 7500 lbs. Until the present time, this equipment was made of ferrous alloys. North American consulted with ALCOA's engineers and specified the use of aluminum because the part, as originally designed, would have been too heavy for its foundation if cast in iron or steel.



to die cast aluminum motor end-bells . . .

ABOVE: Operator removing end-bell casting from one of Emerson-Electric's new Model 400-N Clevelands. End-bell is 6¼" in dia. Weight of shot approx. 2½ lbs. A close-up view of the "as-cast" part is also shown.

BELOW: Cleveland Model 400-N with aluminum shot end. Also available as a hot chamber, zinc machine. Has 36"x40" die plates; 400-tons locking pressure, **strain gage tested.**

EMERSON-ELECTRIC AGAIN SELECTS MODEL 400-N

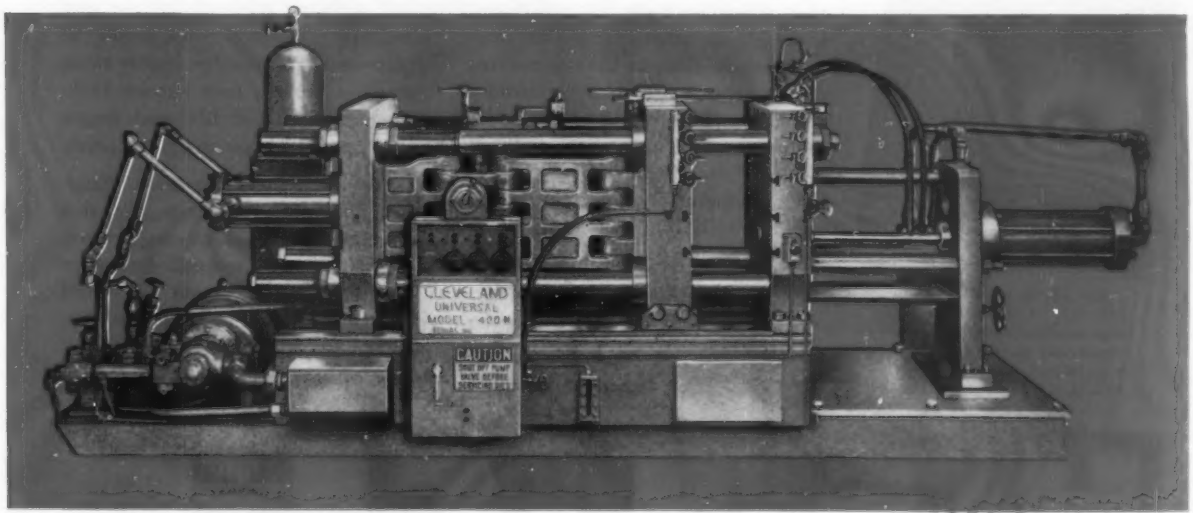
CLEVELANDS

The Emerson Electric Mfg. Co., manufacturer of Emerson-Electric motors and appliances, operates two Model 400-N Clevelands in their St. Louis plant, to cast aluminum motor end-bells.

Based on the excellent performance of these Clevelands, Emerson-Electric has recently installed *two more* Model 400-N Clevelands in their new, modern plant at Paragould, Ark. These new Clevelands are also producing aluminum end-bells in two-cavity dies.

For the Paragould installation, the new Model 400-N's were built as "right-hand" and "left-hand" machines; are located shot end-to-shot end. One operator controls both machines, ladling from a central furnace.

The nation's leading producers of die castings rely on *Clevelands* for dependable, profitable performance. Investigate their advantages for *your* production. Built in 50, 200, 400 and 600 ton capacities, for zinc and aluminum casting. For machine specifications, write for new Bulletin No. 5246.



THE CLEVELAND AUTOMATIC MACHINE COMPANY

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Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

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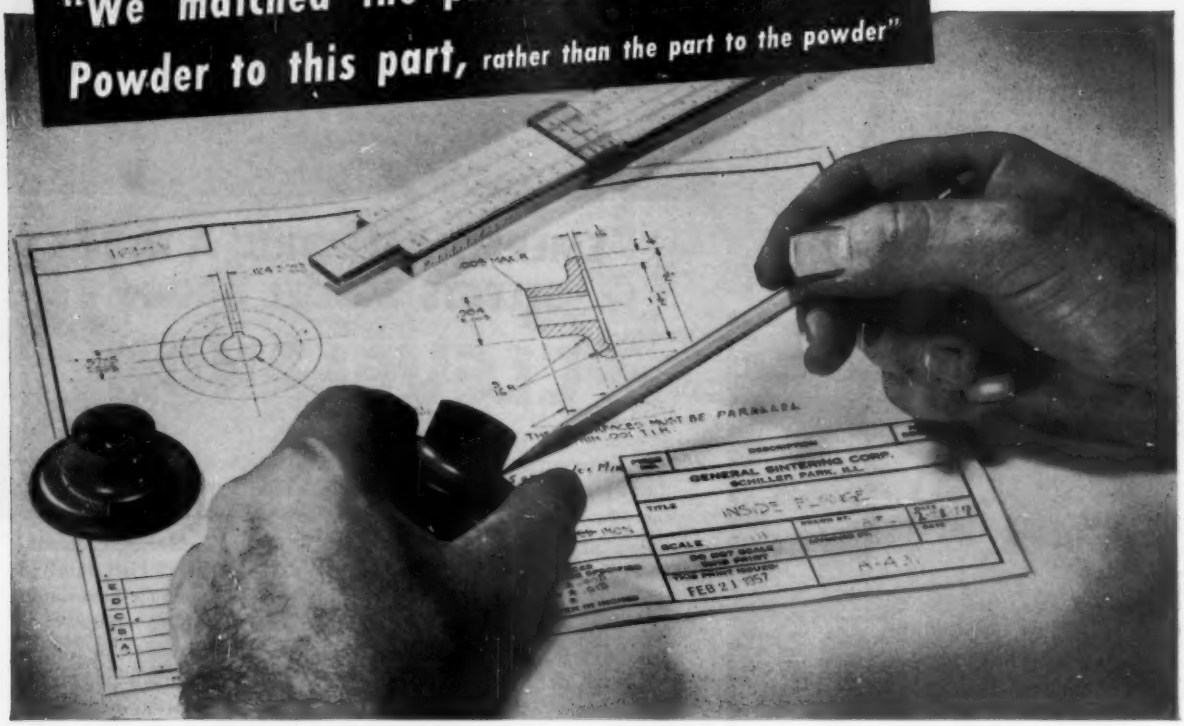
"We matched the preblended Hoeganaes Powder to this part, rather than the part to the powder"



Just off the press. Write for your copy of this fact-filled 12-page brochure that could be your introduction to powder metallurgy benefits in your metal parts production.

In addition, Vernon J. Pingel, Manager and Metallurgical Engineer of General Sintering Corporation of Schiller Park, Ill., points out these all important facts—"by mutual cooperation, in the engineering development of the *preblended* Hoeganaes Powder, the tooling was made to piece part size, without allowing for shrinkage or growth. Such cooperative preplanning enabled us to obtain size control."

Here are the quick-facts regarding this inside flange production:

Specifications called for a powder with a high apparent density (3.25 min.). Required a *preblended* powder, *ready for the press* . . . that could be used with, or without, copper and graphite . . . and that could be infiltrated. The results: higher press densities at less tons/square inch. Thus, longer tool life and larger parts production on any given press.

Your nearby Hoeganaes Engineering Specialist offers you this same kind of research cooperation . . . of powders preblended to your *individual* requirements. A word from you and he's at your service.

HSIC

HOEGANAES SPONGE IRON CORPORATION

RIVERTON, NEW JERSEY

SALES REPRESENTATIVES IN PRINCIPAL CITIES: Birmingham, Chicago, Cincinnati, Cleveland (Fostoria), Edmonton (Alberta, Canada), Los Angeles, Minneapolis, New England (Elmira, N.Y.), Philadelphia (Riverton, N. J.), Pittsburgh, San Francisco, St. Louis

For more information circle No 34 on the Reader Service Card

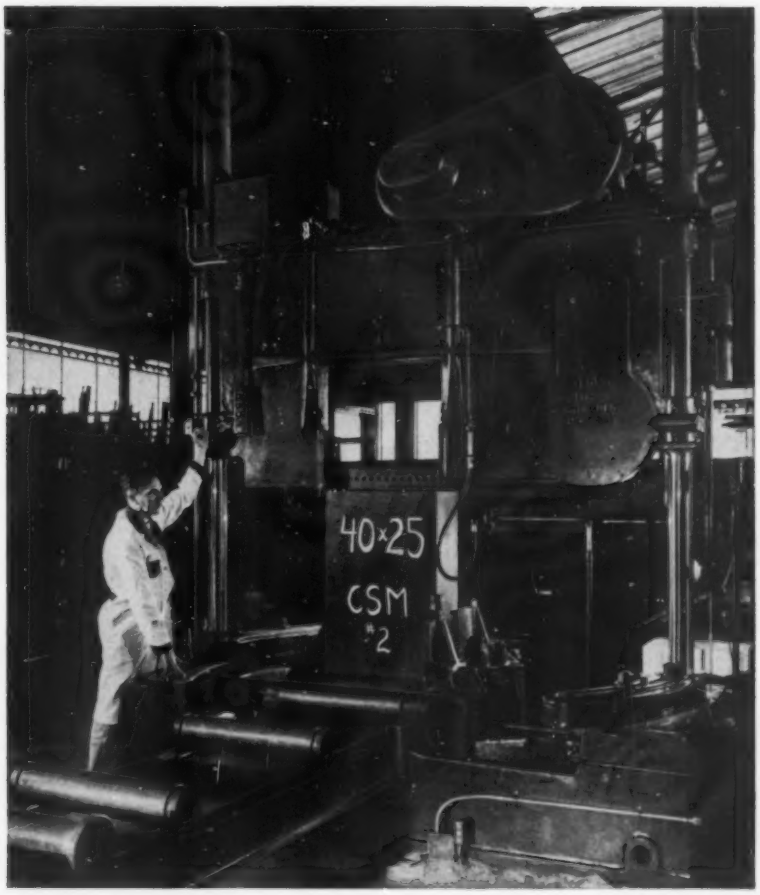


Photo by Hedrich-Blessing

Prompt delivery

of **DIE CASTING DIE STEELS** from warehouse stocks

...every piece ultrasonically inspected

Crucible warehouses from coast to coast stock over 460 sizes of CSM 2 and NU DIE V die casting die steels—1″ to 40″ wide—¾″ to 15″ thick! And they're all available for *prompt* delivery.

What's more Crucible warehouses are equipped to cut die steels to the size you want. The hacksaw pictured above in one of Crucible's warehouses, for example, is the largest made. It can accurately cut die blocks up to 40″ x 25″.

Huge stocks, plus versatile sawing and handling facilities, mean you get the steel you want *when you want it*. There's no need to wait for delivery from mill or forge shop when you can get *prompt* delivery from Crucible warehouse stock.

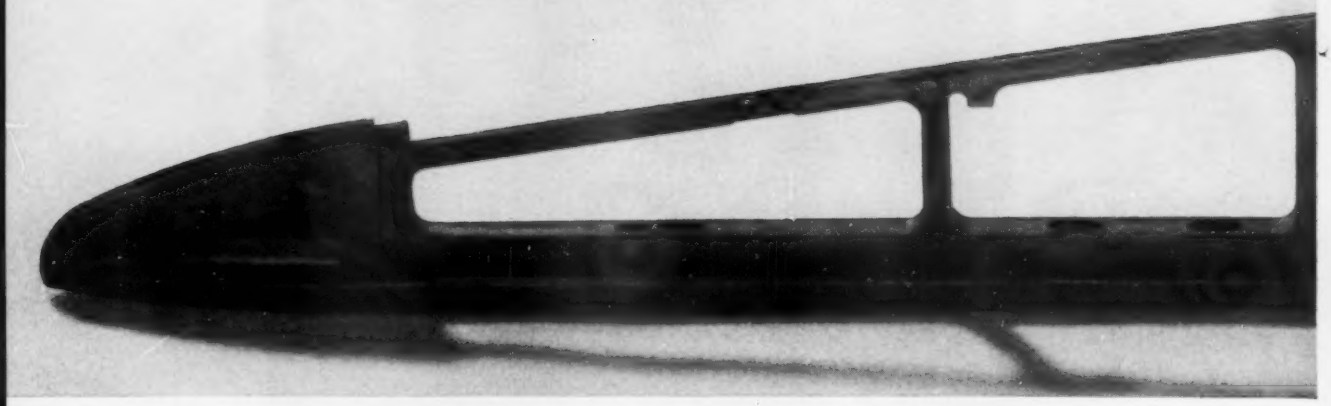
But there's more. Ultrasonic inspection of *every* piece of Crucible die casting die steel assures *sound die steel quality* every time. So next time you need die steels, look no further than your nearest Crucible warehouse. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

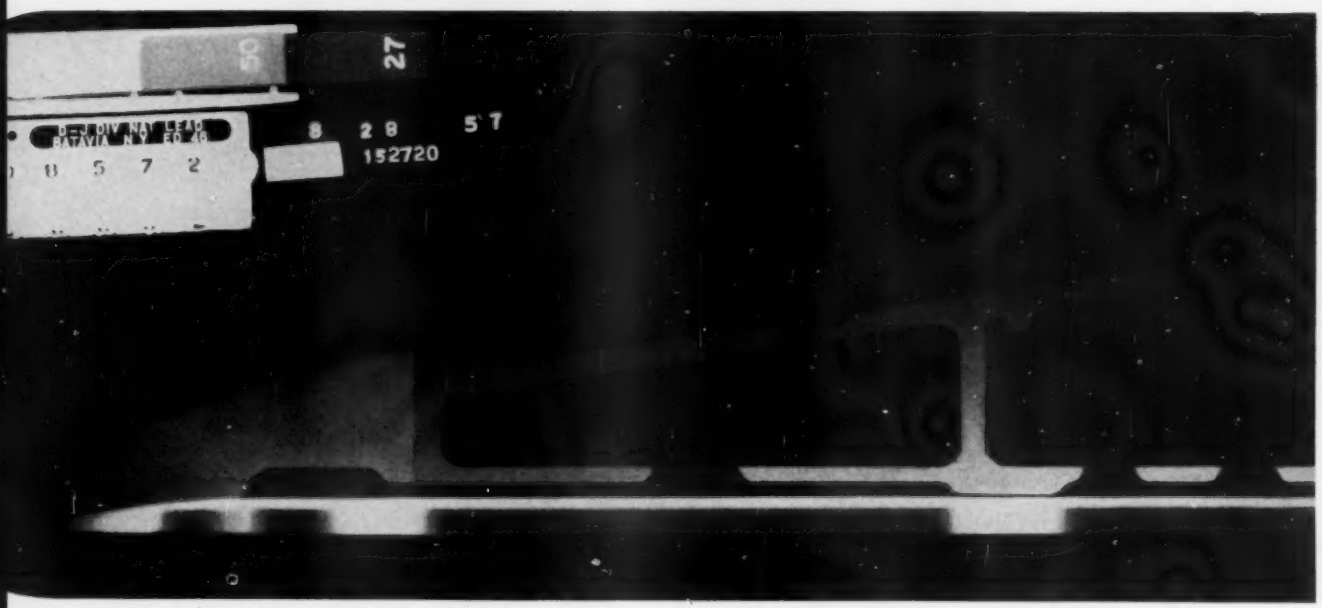
Crucible Steel Company of America

For more information circle No. 23 on the Reader Service Card

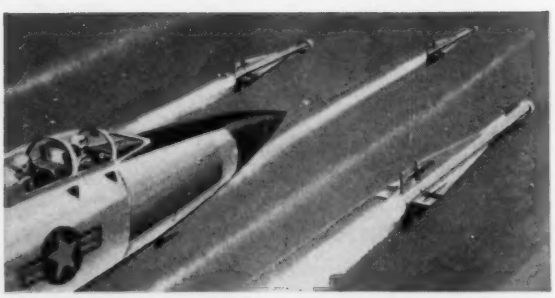
overall length 42 inches



Now...from Doehler-Jarvis...die castings



X-ray of the Falcon's fin proves



The Falcon is an air-to-air missile built by Hughes Aircraft Company for the U. S. Air Force. Its light weight die cast stabilizer fins resist severe strain during course changes. It uses other Doehler-Jarvis die castings also.

Now *you* can have structurals die cast to standards as high as those for primary aircraft structurals*.

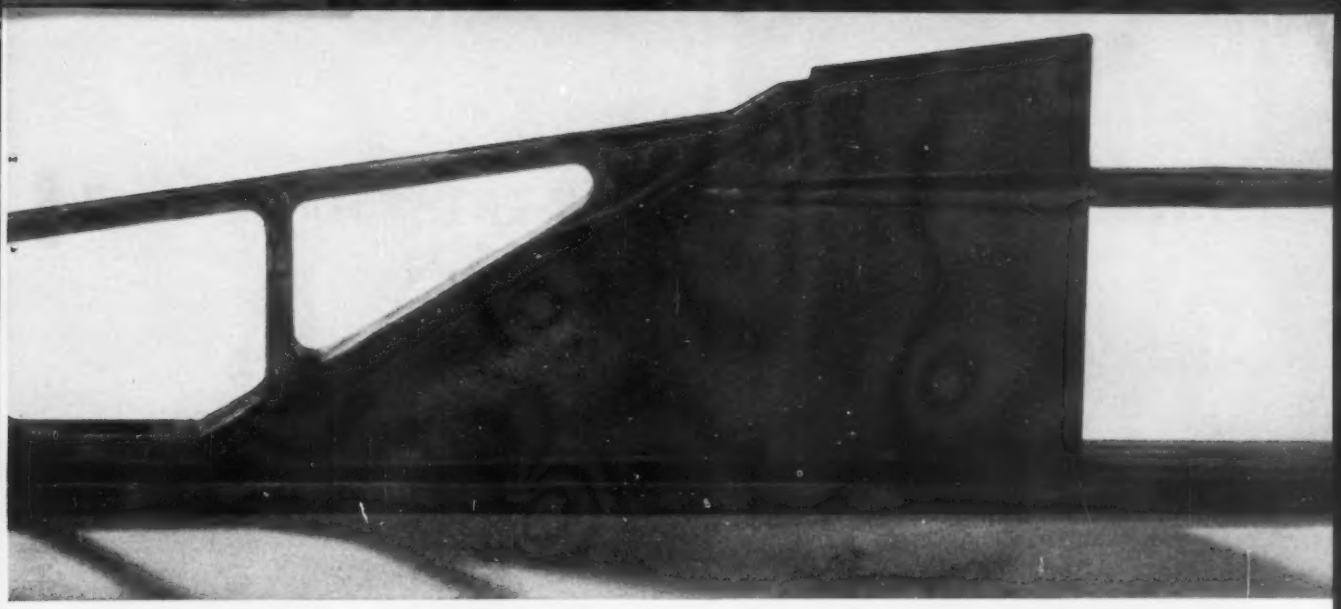
Die cast! With all the economy, precision, surface superiority, ease of assembly that implies. Die cast of aluminum, or of a high-purity magnesium alloy, like the 42" Falcon stabilizer fin.

They said it couldn't be done!

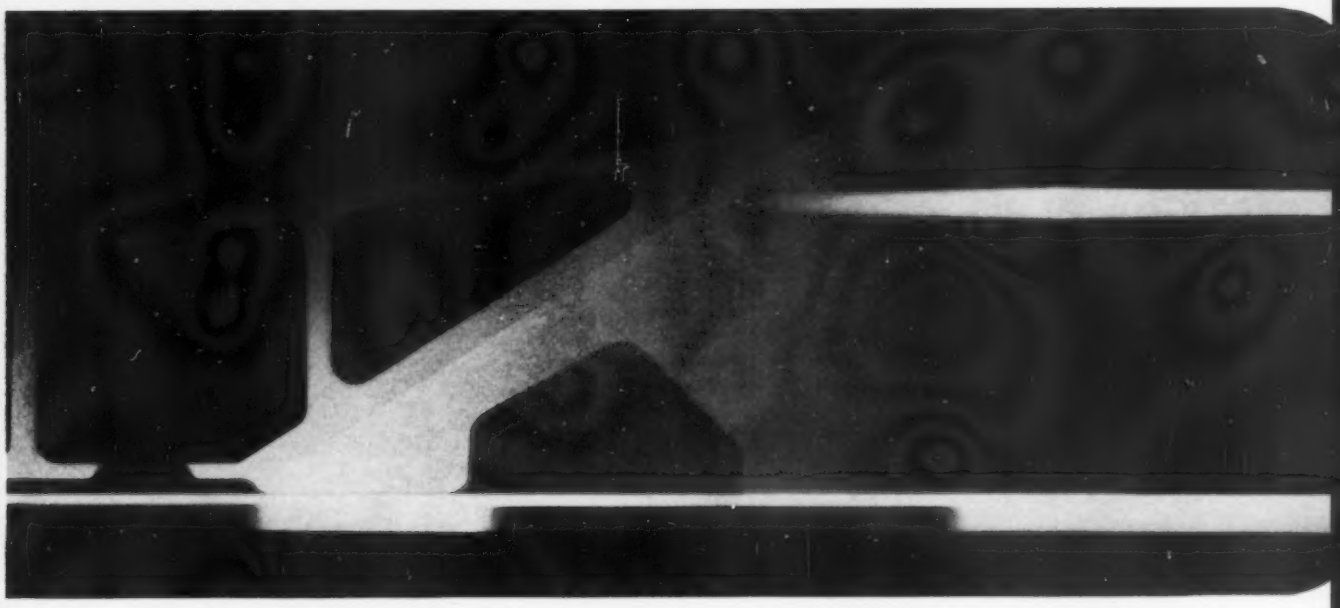
But there you see such a structural! Along with X-ray proof of soundness, uniformity, primary-aircraft-structural* quality.

Mind you! The Falcon fin is in commercial production. Doehler-Jarvis has die cast thousands. Each has had to pass 73 inspections before acceptance . . . including 100% X-ray.

In *one* control, sections of castings are continuously tested for tensile strength. In this examination of physical properties, the castings normally exceed tensile specifications by 15% or



# of primary-aircraft-structural* quality



their uniformity and soundness

more. Quality is so high there has never been a single test below specification.

How did this come about?

Like many developments in die casting, this one started with a customer's need . . . Hughes Aircraft's.

They, and the Armed Services, needed such castings. The parts *might* be made other ways. But at what cost! What sacrifice in weight — and materials! If it *could* be die cast, if there *were* a magnesium alloy able to stand supersonic air stresses . . .

It took a while. But, with close cooperation from engineers of both Doehler-Jarvis and Hughes, the way was found.

Now you can list die castings of primary-aircraft-structural* quality among D and J availabilities. Get them from any Doehler-Jarvis plant.

*A primary aircraft structural is a major load-bearing component member any single failure of which would result in loss of the aircraft.

Doehler-Jarvis
DIVISION OF NATIONAL LEAD COMPANY
General Offices: Toledo 1, Ohio

In Canada:
Barber Die Casting Co. Limited
Hamilton, Ontario

For more information circle No. 44 on the Reader Service Card

"THERE'S A REASON FOR OUR ENTHUSIASM . . ."

"Our H-P-M's Give Us Better Quality Castings and Less Scrap . . . Consistently"

Kiowa Corporation, Marshalltown, Iowa, says, "The advanced principles of the H-P-M die casting machines have solved many of our quality problems and our day-to-day die maintenance problems have been reduced. We have two 200 ton, two 600 ton and another 600 ton H-P-M on order."

The new H-P-M die casting machines offer unlimited possibilities for die casting improvements. Here are the reasons: H-P-M's link wedge mold clamp locking mechanism pre-stresses the machine frame so that when metal is injected at high speeds and pressures, the mold is firmly clamped. Frame deflection is minimized due to the "beef" in platen and tie rods. Casting dimensional tolerances and density factors are held; flash is reduced to the minimum; scrap loss is practically nil.

Another important advancement, H-P-M's injection speed control, is infinitely adjustable for acceleration, high speed and pressure follow-through. Intricate detail is accurately reproduced; surface finish is greatly improved; pressure follow-through packs metal for high density.

Remember—for top quality die castings . . . better density control . . . uniform finishes . . . less scrap . . . more year-'round success and satisfaction—H-P-M die casting machines are 'way ahead of the field. Write for Bulletin 5400-J and get the complete facts.

H818

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- ☐ Permanent Mold Castings
- ☐ Plaster Mold Castings
- ☐ Shell Mold Castings
- ☐ None of these

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Company ..... *Kind of Business* .....

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Please send me information and literature on items circled below.

1	18	35	52	69	86	103	120	137	154	171	188	205	222	239	256	273	290
2	19	36	53	70	87	104	121	138	155	172	189	206	223	240	257	274	291
3	20	37	54	71	88	105	122	139	156	173	190	207	224	241	258	275	292
4	21	38	55	72	89	106	123	140	157	174	191	208	225	242	259	276	293
5	22	39	56	73	90	107	124	141	158	175	192	209	226	243	260	277	294
6	23	40	57	74	91	108	125	142	159	176	193	210	227	244	261	278	295
7	24	41	58	75	92	109	126	143	160	177	194	211	228	245	262	279	296
8	25	42	59	76	93	110	127	144	161	178	195	212	229	246	263	280	297
9	26	43	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298
10	27	44	61	78	95	112	129	146	163	180	197	214	231	248	265	282	299
11	28	45	62	79	96	113	130	147	164	181	198	215	232	249	266	283	300
12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302
14	31	48	65	82	99	116	133	150	167	184	201	218	235	252	269	286	303
15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304
16	33	50	67	84	101	118	135	152	169	186	203	220	237	254	271	288	305
17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306

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3	20	37	54	71	88	105	122	139	156	173	190	207	224	241	258	275	292
4	21	38	55	72	89	106	123	140	157	174	191	208	225	242	259	276	293
5	22	39	56	73	90	107	124	141	158	175	192	209	226	243	260	277	294
6	23	40	57	74	91	108	125	142	159	176	193	210	227	244	261	278	295
7	24	41	58	75	92	109	126	143	160	177	194	211	228	245	262	279	296
8	25	42	59	76	93	110	127	144	161	178	195	212	229	246	263	280	297
9	26	43	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298
10	27	44	61	78	95	112	129	146	163	180	197	214	231	248	265	282	299
11	28	45	62	79	96	113	130	147	164	181	198	215	232	249	266	283	300
12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302
14	31	48	65	82	99	116	133	150	167	184	201	218	235	252	269	286	303
15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304
16	33	50	67	84	101	118	135	152	169	186	203	220	237	254	271	288	305
17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306

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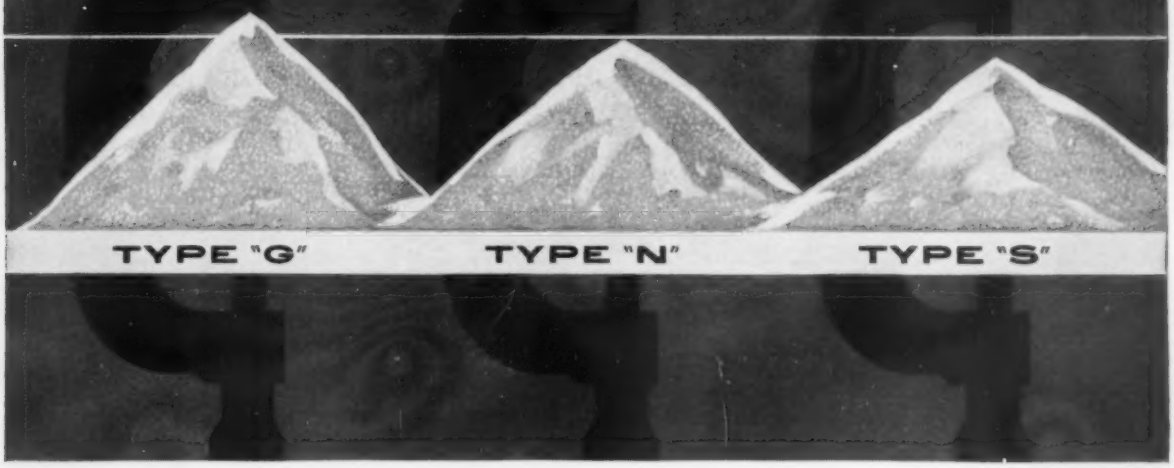
REPUBLIC IRON POWDERS *with* cdf



give you predictable dimensional characteristics after sintering

Now, for the first time, you can accurately predict what the dimensional characteristics of iron powder will be after sintering operations. You can eliminate the element of uncertainty in powder reaction, before a part or tool is designed, before a production run is started.

This major development is the result of Republic's exclusive *Controlled Dimensional Factor* process of manufacturing iron powder.

CDF means that in the presence of copper, Republic Iron Powder—depending on type—can be made to grow, shrink, or remain stable within acceptable tolerance limits. The powders have been designated as:

TYPE "G" FOR GROWTH—A powder having a definite growth characteristic in the presence of copper. It was developed for use in many *existing* dies designed for powder which expands when sintered.

TYPE "N" FOR NORMAL—This powder has been given normal variation in dimensional change from slight shrinkage to slight growth, depending upon the end result required.

TYPE "S" FOR SHRINKAGE—A powder with an extremely high shrinkage characteristic which can be used to attain certain tensile strengths with lesser quantities of copper.

CDF provides definite benefits for everyone concerned with the design and fabrication of iron powder sinterings. Consistently uniform shrinkage and growth values aid the design engineer in establishing final dimensions of parts. Tool engineers can design tools to part print dimensions with the assurance that tolerances, transverse to the direction of pressing, can be held within ± .001 inches per inch. Fabricators can produce consistently uniform sinterings at faster rates and at minimum cost.

Republic Booklet Adv-763 contains complete information on test evaluations, chemical composition, and physical properties. Mail the coupon for your copy; or for obligation-free metallurgical service.

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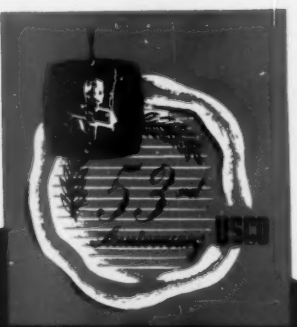
USCO K-Z

USCO K-Z Aluminum Die-Casting Alloy is a high zinc variation of the popular USCO K (AXS-679 Revision 3) with zinc up to 2%. USCO K-Z is growing in popularity because the higher zinc content gives better machinability and castability while the mechanical and physical properties remain the same as USCO K.

USCO K-Z, like all other USCO Aluminum Alloys, is production and quantometric controlled from raw materials to finished ingot under the most modern methods of alloying.

If you desire, USCO K-Z can be tailor-made to fit your specific needs. For a lower cost aluminum die-casting alloy, order USCO K-Z!



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Quotes from C. E. Oursler, Mgr.,
Alloy Steel & Iron Casting Division, Howard Foundry Co., Chicago

HIGH TENSILE STRENGTH MEANS LESS RESIN PER SHELL MOLD

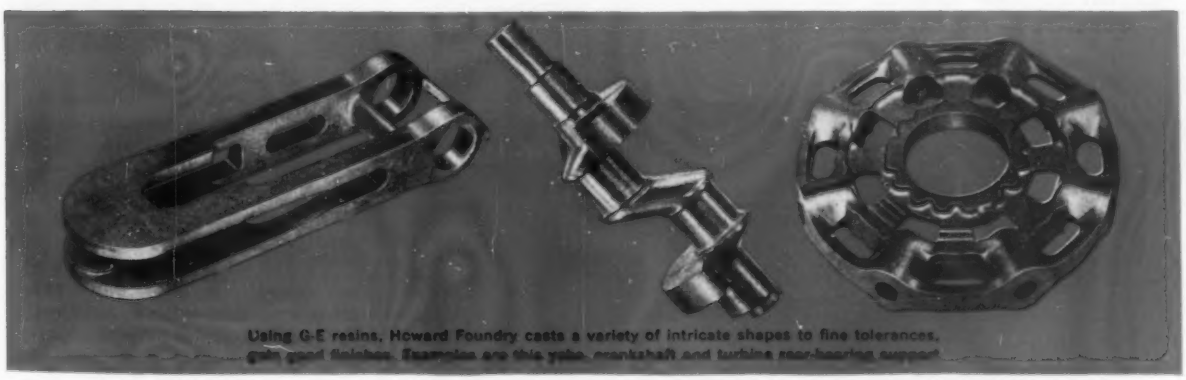
"G-E resins have higher tensile strength than many others we have tried, so we use less resin per mold."

GOOD HOT STRENGTH MEANS FEWER CASTING LOSSES

"G-E resins have excellent hot strength, and casting losses from thermal shock are rare."

UNIFORMITY MEANS BETTER PRODUCTION CONTINUITY

"The consistent high quality of these resins helps keep our production right on schedule."



Using G-E resins, Howard Foundry casts a variety of intricate shapes to fine tolerances, gain good finishes. Examples are this yoke, crankshaft and turbine rear-bearing support

THESE ARE THE REASONS WHY G-E SHELL MOLDING RESINS CUT COSTS FOR HOWARD FOUNDRY CO.

G.E. offers a wide range of shell molding resins, each designed to help you make better molds and cores. Write for technical information on G-E shell resins, and for the helpful brochure "59 Answers to Your Shell Molding Problems." General Electric Co., Section PM-6, Chemical Materials Department, Pittsfield, Mass.

Progress In Phenolics

GENERAL ELECTRIC

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WANT TO
CUT COSTS
ON YOUR
DIE CASTINGS?

LOOK INTO
THIS "New"
MODEL 150Z
AMERICAN
DIE CASTING
MACHINE

FOR ZINC — TIN — LEAD

- BIGGER—4 lb. shot capacity. 150 ton locking pressure.
- BETTER—20" x 21" platens—solid steel toggles.
- LOWER COST—Much lower than machines of comparable performance.
- FASTER—Up to 700 shots per hour.
- LOWER OPERATING COST—Only 20¢ per hour for gas and electricity.
- EASY TO BUY—Financing up to 36 months.

COMPLETE — SHIPPED READY TO OPERATE — NO EXTRAS TO BUY.

Model 150A
available for Aluminum,
Brass, Magnesium.

Look into the cost cutting possibilities of this new machine — premium quality castings produced at lower cost than ever before.

We will help install your American Die Casting Machine and train one of your men as an operator.

Write — wire for catalog and price.

AMERICAN DIE CASTING MACHINERY CO.

1752 W. Winona St., Chicago 40, Ill., PHONE: LOngbeach 1-7118-9

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LETTERS

the readers' forum

GOLD DIP PROCESS

In the September '57 issue of Precision Metal Molding Magazine, an article mentions a dip process which imparts 24 carat gold to zinc die castings. We would like to have more information on the process and also the name of the vendor. — J. H. H.

The source of information has been sent. — Editor.

SLUSH CASTING DATA

We would greatly appreciate a listing of any available information regarding the slush casting process as it is used in the manufacture of ornamental electric fixtures. We would also like to have details on processes and alloys. — K. K.

This information has been forwarded. — Editor.

DIE CASTING DIRECTORY

Recently you published an issue giving a list of names and addresses of everyone in the die casting business today.

This information also told which metals were handled, whether the firm was captive or on a jobbing basis. The article also listed trade marks.

I would appreciate it very much if you would send me a copy of this issue of PMM.—P. C. C.

We are sending you a copy of our January '57 issue which contains our die casting directory, first published annually this year. Another, up-to-date directory will appear in the January '58 issue of the magazine. — Editor.

DIE CASTING DATA

I need methods of determining piece-part costs in the die casting industry. I also need books on the subject. — E. R.

A list has been sent. — Editor.

Readers are invited to write the editor of Precision Metal Molding Magazine. We will try to answer your questions or refer you to reliable sources. Editor.

OILITE

IN AN AUTOMATIC WASHER HELPS BUILD CUSTOMER SATISFACTION -YET COSTS NO MORE

OILITE bronze agitator shaft bearing
OILITE bronze upper center post bearing
OILITE bronze rubber-mounted lower center post bearing
OILITE bronze thrust washers (2)
OILITE bronze pulley bearing
OILITE bronze thrust bearing
OILITE bronze water pump bearing

Photos courtesy Whirlpool-Seeger Corporation St. Joseph, Michigan

Another cost-saving application of Amplex Powder Metallurgy

Quality is a *must* for trouble free operation, continued customer satisfaction. And quality depends upon the excellence of every part, every component. For many years Whirlpool-Seeger has used OILITE center post bearings, agitator shaft bearings, water pump bearings and pulley bearings in their automatic washers. Whirlpool-Seeger uses these and other OILITE parts for very good reasons.

First of all, the manufacturer knows OILITE heavy-duty bronze bearings will meet specifications. Chrysler-Amplex precision production assures him OILITE bearings capable of carrying their loads safely, surely and quietly.

Then too, Chrysler-Amplex plant and facilities—largest and most complete of any in the metal powder fabrication industry—promises on-time deliveries in any quantity.

Moreover, in using OILITE bearings the manufacturer selects a product his customers know and respect for superior engineering.

Finally, this manufacturer, like a great many others, finds OILITE bearings—despite all their advantages—cost no more.

Chrysler-Amplex representatives and dealers are located in principal cities in United States and Canada. Let the nearby representative help you. Find him in the yellow section of your telephone directory under—"Bearings—OILITE."

Representatives and dealers located in principal cities in United States and Canada.

A CHRYSLER OILITE PRODUCT

*OILITE is a registered trademark

*Only Chrysler Makes **Oilite****

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BEARINGS • FINISHED MACHINED PARTS • PERMANENT METAL FILTERS • FRICTION UNITS • FERROUS AND NON-FERROUS METALS

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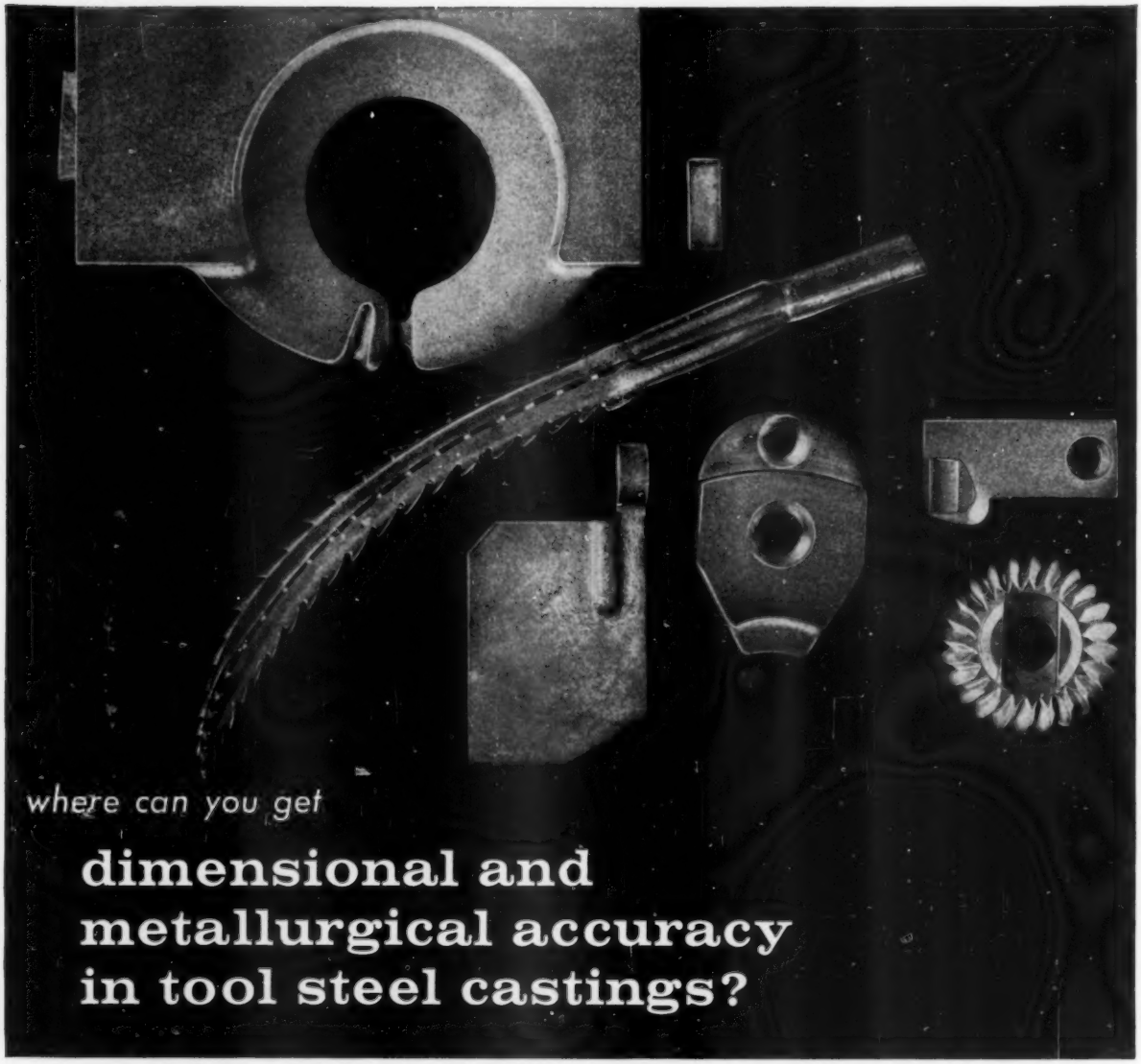

where can you get

dimensional and metallurgical accuracy in tool steel castings?

The quality of tool steel castings depends heavily on metallurgical control and foundry techniques which can be acquired only through long experience in handling tool steels. That's why it will pay you to get your castings directly from Crucible, largest and leading producer of tool steels.

Only Crucible can furnish precision castings in Ketos, Rexalloy, Rex M-2, Rex AA, Airkool, HYCC and Airdi 150—tool steels that solve wear, abrasion and temperature problems when ordinary alloys fail.

Crucible Accumet® Precision Investment Tool Steel Castings are regularly produced with a tolerance of ±.005″ (and even ±.002″ or ±.003″) and a surface finish of 125 RMS to 62 RMS . . . and in almost any shape or configuration.

Uniformity in response to heat treatment. Crucible quality control, from heat to heat, and complete inspection facilities ensure the uniformity in hardenability so necessary for successful tool steel castings.

Crucible Accumet Tool Steel Castings can help you reduce costs and improve product performance. Consider Crucible's extensive facilities and experience when you need either investment or sand castings. Write for free booklet to: *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pennsylvania.*

CRUCIBLE first name in special purpose steels

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For more information circle No. 22 on the Reader Service Card

There's a Good Reason why

ZINC DIE CASTINGS

are so widely used . . .

at *Swingline*

IT'S FLEXIBILITY

TWO DIFFERENT MODELS OF THE SAME MACHINE FROM THE SAME DIE!

—including inserts, mounting studs, holes and projections that save so much time in assembly.

Both of these housings for the SWINGLINE feather-touch electric stapler were made in the same die by using a cut-off section to eliminate the long anvil of the standard model. The short stapler is for industrial, laundry and dry-cleaner use.

This FLEXIBILITY of die casting with ZINC offers a great variety of time-saving and money-saving advantages — almost certainly some that can be applied to your products. See your die caster and get his advice.

THE NEW JERSEY ZINC COMPANY

160 FRONT STREET • NEW YORK 38, N.Y.

HORSE HEAD PRODUCTS

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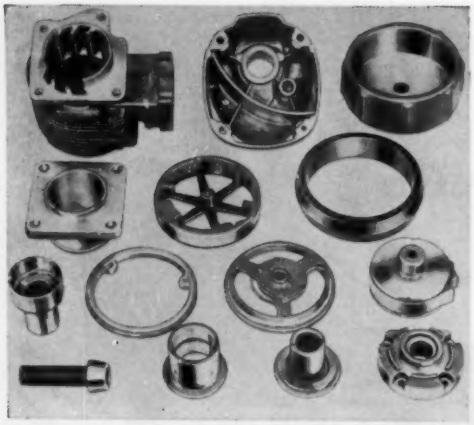
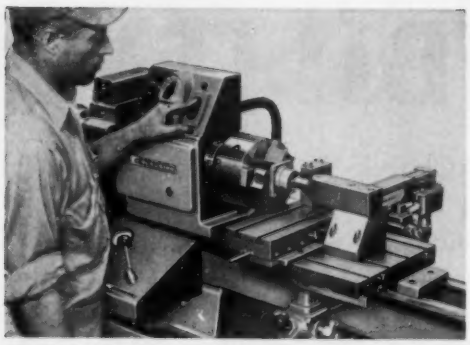
500%

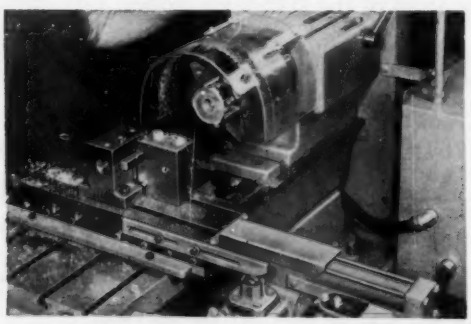
PRODUCTION INCREASE— PROPORTIONATE COST REDUCTION IN SMALL PARTS MACHINING!



If your operations call for turning, boring, facing, forming, grooving, chamfering, beveling, or cut-off of parts such as these (pieces shown merely suggest the almost endless variety), there's a CLAUSING Hydra-Cycle for handling these operations in combination or singly, with great speed, to close tolerances, and at low cost.



All the operator has to do is load the machine, press a button, take out the machined piece seconds later. The Hydra-Cycle does the rest, automatically.



Six surfaces are being machined in the operation shown above. As is the case with most jobs that can be handled by the Hydra-Cycle, the tooling required is simple, inexpensive.

MODEL 6405
4 Operating CYCLES

THE NEW CLAUSING SEMI-AUTOMATIC BORING AND TURNING MACHINE

4 MODELS—ONE TO MEET YOUR EXACT NEEDS

Users report production increases of 200% to 500%, with corresponding cost reduction, and jobs have been held to .0002 tolerance on production runs. Average job change and set-up takes from 15 to 30 minutes. No special jigs or fixtures required . . . simple block tool holders, carbide insert bits and standard boring bars will handle most jobs. Operator merely loads, presses starter button, and unloads finished pieces *seconds later* . . . machining operations are performed automatically . . . simultaneously or in continuous sequence. A time and money saver on short as well as long production runs.

SPECIFICATIONS: 5″ x 16″ cross slide with 4-11/16″ swing, 5″ travel; 12″ x 14″ table with 9″ swing, 8″ travel. Prices start at $4250 with electricals and hydraulic equipment installed.

NO OBLIGATION OFFER!

Simply send us complete data . . . drawings of rough and finished part, indicating material, tolerances, finish required, production rate — and, samples of finished and unfinished parts. Our engineering department will gladly make recommendations for the use of the Hydra-Cycle model best suited to your requirements. No obligation. Mail to Hydra-Cycle Department, Clausing Division, Atlas Press Company, Kalamazoo, Michigan.

CLAUSING

CLAUSING DIVISION
ATLAS PRESS COMPANY
12-142 N. Pitcher St. — Kalamazoo, Michigan

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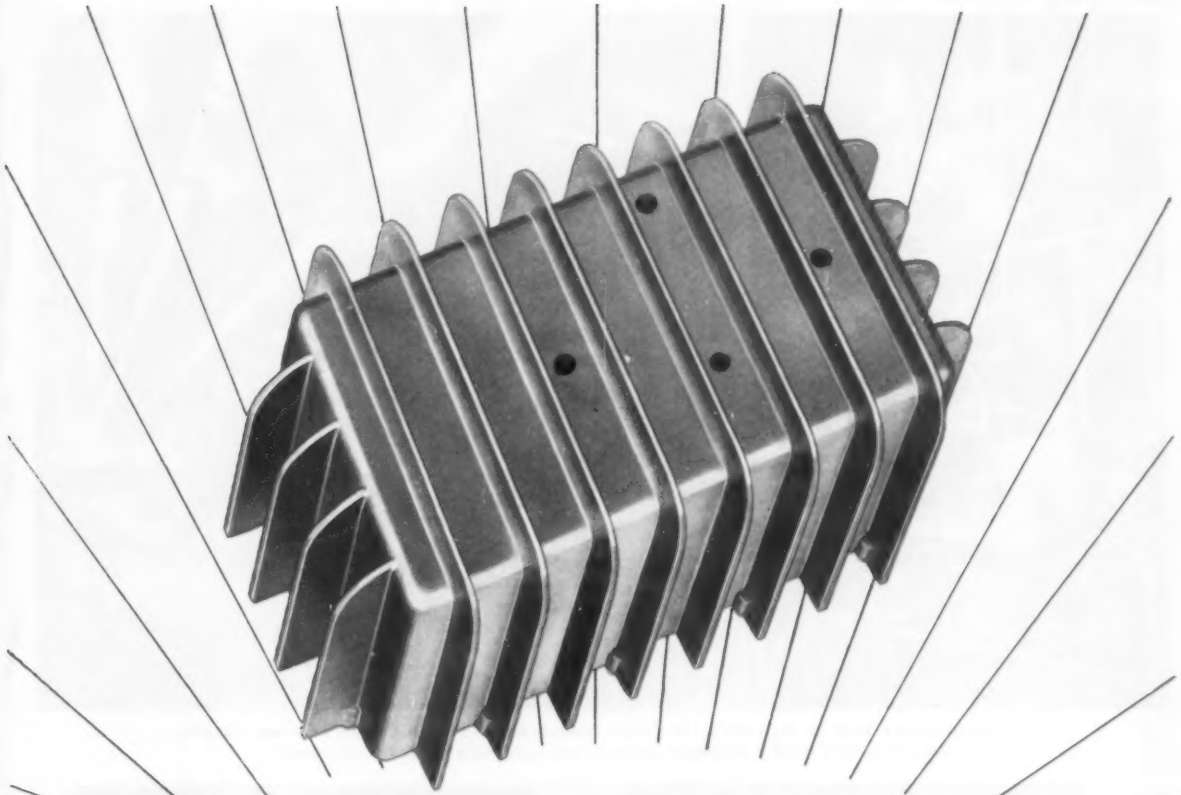

Multiple Operations
can often be reduced to **Two**
with **Madison-Kipp**
zinc and aluminum die castings

Tool designers, frequently, influence the selection of die castings to reduce tooling costs and to reduce the number of machine and assembly operations required.

Cooling fins, for instance, can be stamped and formed and assembled to a housing with multiple operations. Seasoned die designers and expert tool makers at Madison-Kipp can usually make a more efficient, stronger and lighter part in one die casting operation plus a fast trimming job.

Possibly similar savings can be applied to your parts. We will be glad to try to assist in analyzing your problems.

Please clip this ad as a reminder to contact us when you have die casting requirements.

kipp

MADISON-KIPP CORPORATION
213 WAUBESA STREET • MADISON 10, WIS., U.S.A.

Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

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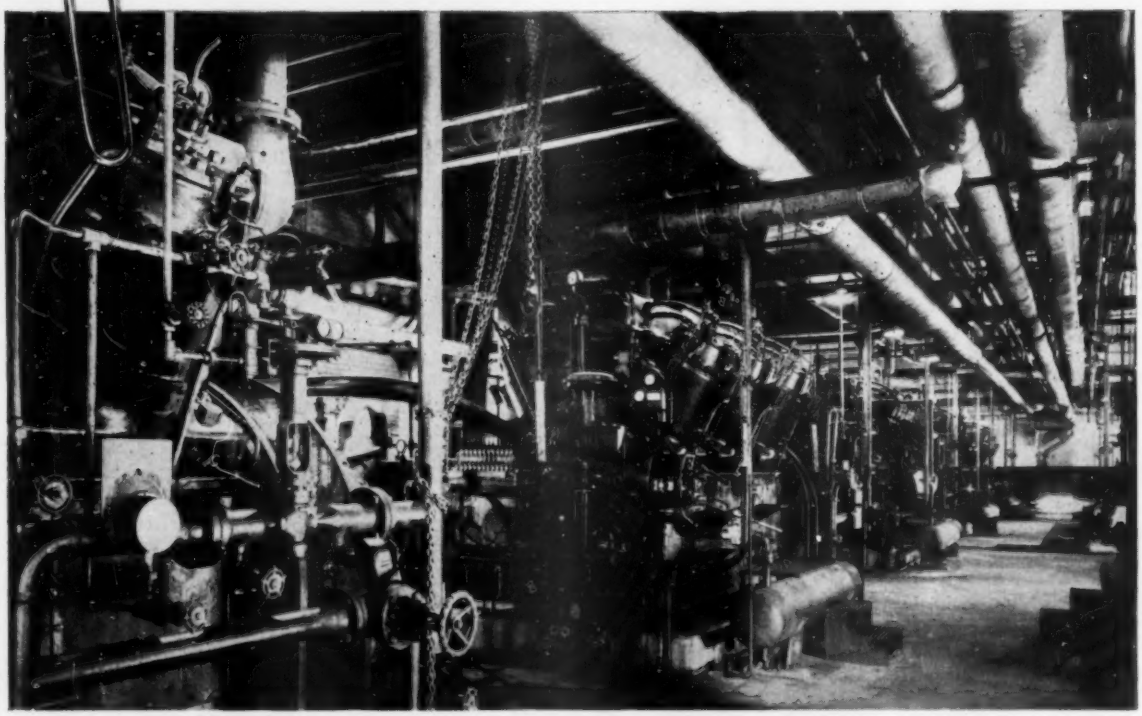
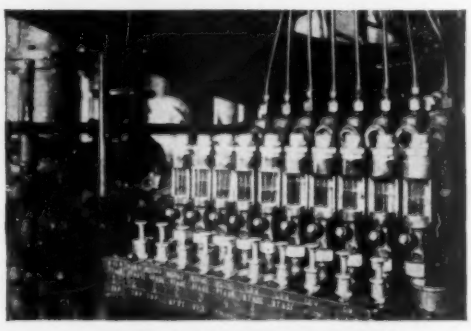
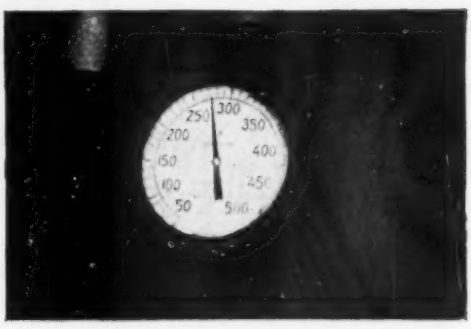


"... Cellulubes were tested for two years in four Cooper Bessemer Air Compressors. Cylinder wear was negligible. Deposits normally found in compressor auxiliaries and valves were reduced or eliminated."



"... A conventional lubricator will pump Cellulubes satisfactorily. No obnoxious vapors—does not present a personnel problem in terms of handling a toxic material."



"... No pressure surges nor evidence of fire in the air accumulator when Cellulubes are used. They are excellent lubricants, and also are effective as detergents."

CELANESE CORPORATION OF AMERICA, CHEMICAL DIVISION
DEPT. 589-L, 180 MADISON AVENUE, NEW YORK 16, N. Y.

Please send me:

☐ Technical bulletin ☐ Sample of_____viscosity.

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

Application I have in mind_____

For more information circle No. 17 on the Reader Service Card

From a trial file covering two years testing in Cooper Bessemer 3-stage air compressors

"NO PRESSURE SURGES...NO EVIDENCE OF FIRE... EXCELLENT LUBRICATION...WHEN FIRE-RESISTANT CELANESE CELLULUBES ARE USED!"

"Cellulube has now been in four of our Cooper Bessemer air compressors for approximately two years. The compressors were inspected during a recent Catalytic Reformer General Inspection. Cylinder liner wear was negligible, particularly when compared to the amount of wear we had experienced when previously using a synthetic lubricant. Cellulube, in addition to acting as a lubricant, is also effective as a detergent. Compressor cylinder air passages which had been heavily coated with carbonaceous materials and deposits laid down by the previous synthetic lubricant, are gradually being removed and the compressors again show the original factory finish. Deposits on valve cages and plates have been reduced and are no longer a problem.

"Cellulube does not present a personnel problem in terms of handling a toxic material. There are no obnoxious vapors from Cellulube. A conventional lubricator will pump Cellulube satisfactorily.

"There have been no pressure surges nor evidence of fire in the air accumulator.

"We believe this material is an excellent lubricant plus the fact that acting as a detergent the deposits normally found in compressor auxiliaries and valves have been reduced or eliminated."

These results are typical of what you can expect from Celanese Cellulubes. They have been developed to meet the pressing need for fire-resistant lubricants which virtually eliminate the problem of carbon deposits.

Celanese Cellulubes are available in 6 controlled viscosities: 90, 150, 220, 300, 550, 1000, S.U.S. @ 100° F. These straight phosphate esters provide excellent lubricity, are non-corrosive and non-reactive.

Celanese Cellulubes open new areas for in-plant protection against fire and explosion. Evaluate them in your own operation. Use coupon to request samples and technical data.

Celanese®
Cellulube®

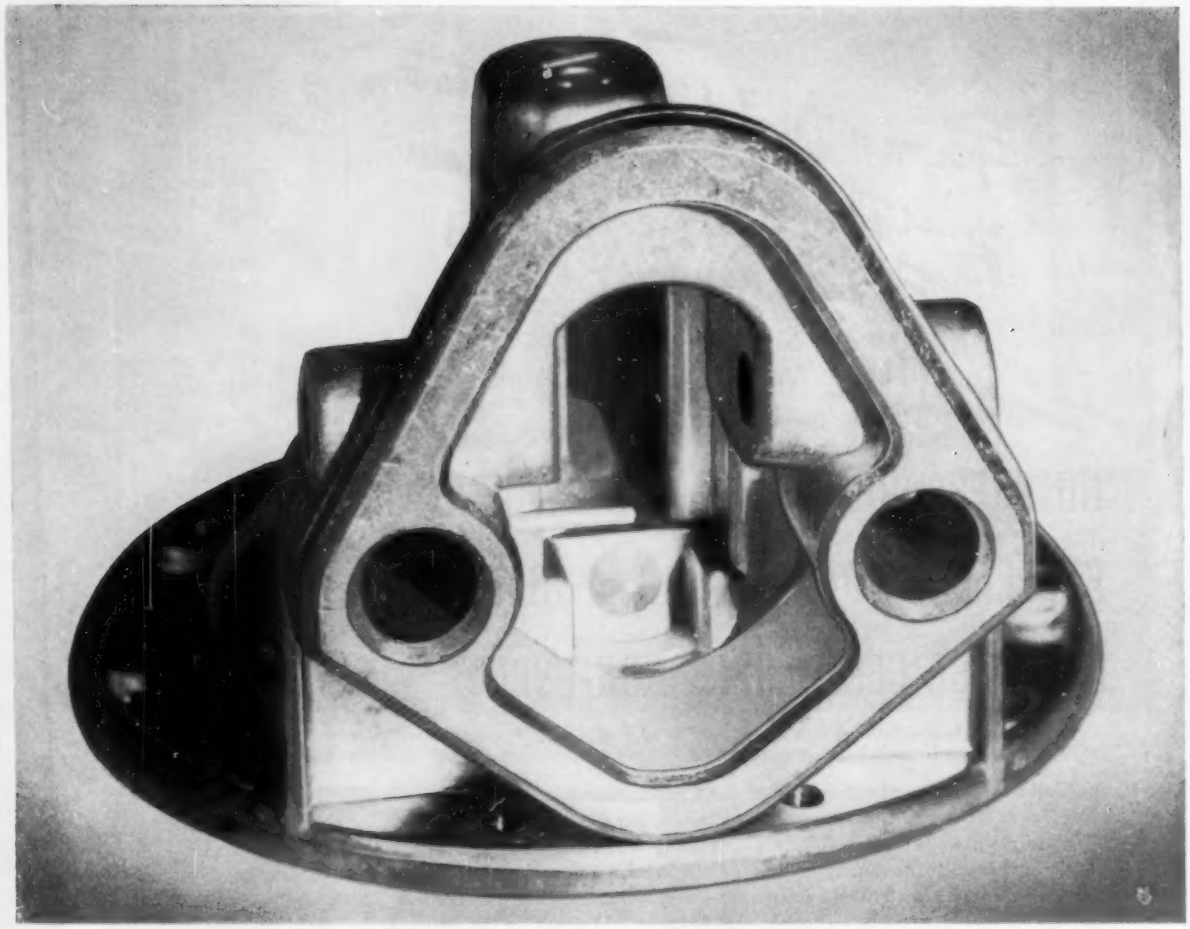
Celanese
CHEMICALS

Celanese Corporation of America, Chemical Division, 180 Madison Avenue, New York 16, N.Y.

In Canada: Canadian Chemical Co., Limited, 2035 Guy Street, Montreal, P. Q., Canada.

Export Sales: Amcel Co., Inc., and Pan Amcel Co., Inc., 180 Madison Avenue, New York 16, N. Y.

CELANESE CELLULUBES



DIE-CAST WITH TADANAC ZINC...

"but what is it?"

The die-casting industry of today is producing more and more complicated shapes, never before thought to be possible. Our illustration is typical of such shapes . . . using Tadanac Zinc of course, because it's ideal for low temperature high speed operation, and has the essential tensile strength and freedom from corrosion.

Tadanac Brand's consistent high purity, its guaranteed supply position backed by one of the world's largest zinc producers and a prompt delivery service, make it a preferred brand by die casters.

If you require any information or assistance regarding your Zinc die-casting operations, write to our Metal Sales Division, where your inquiries will be promptly attended to by our Technical Sales Service Department.

The photo shows part of an Automobile Fuel Pump Casing

COMINCO

THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA LIMITED

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57-65-T

TADANAC ZINC SHAPES THE THINGS TO COME

For more information circle No. 75 on the Reader Service Card

Die Slick case histories

"Your Die Slick No. 9 has enabled us to produce zinc castings with a cleaner and better surface finish."
Northern Iowa Die Caster

"With Die Slick our dies operate almost twice as long without cleaning due to practically no carbon formation on cores and ejector pins."
Large Chicago Manufacturer

"We are now casting a .405" wall casting which would not be possible without Die Slick. Thanks for a marvelous product."
Midwest Diecasting Jobber

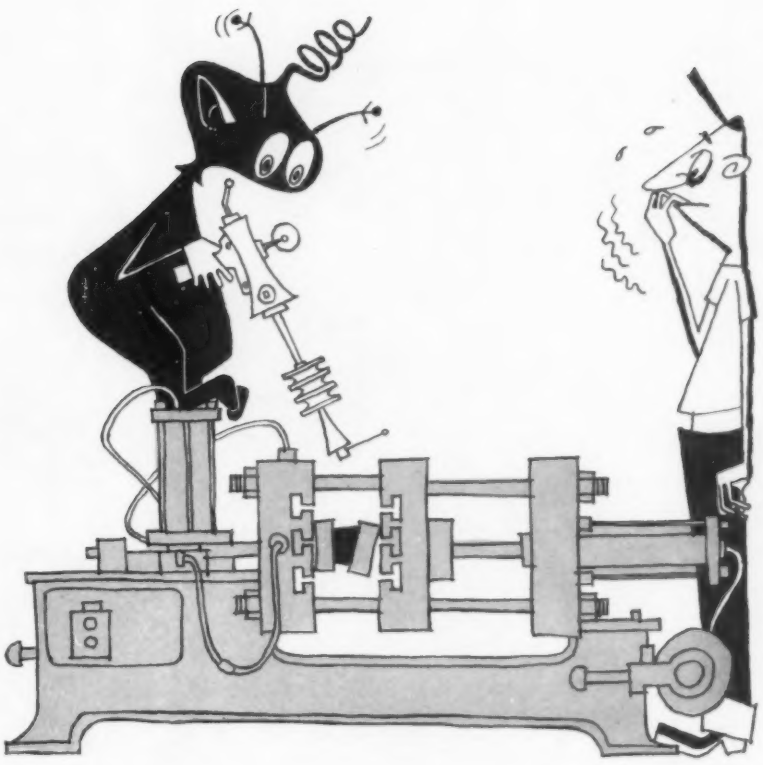
"Die Slick has increased our production rate and improved the quality of our castings."
Michigan Manufacturer

"Your Plunger-Slick is the greatest plunger lubricant we have ever used . . . and we have tried them all."
Western Diecaster

"I have been with the pressure die casting business since its experimental stages and have tried everything imaginable to prevent galling and still get good surface finish . . . and can truthfully say Die Slick No. 3 is the very best."
Well-known Southern Diecaster

"On hardware jobs it (Die Slick #9) has shown a marked improvement on the finish of the castings."
Large Chicago Diecaster

"We are using Die Slick by the 55-Gal. drum because it keeps our scrap down to a minimum and our die cavities free from scale."
Large New Jersey Producer of Automotive Hardware



Don't Disintegrate . . . use Die Slick!

Use Die Slick to prevent sticking, scoring, ejector pin wear on any metal or alloy you are die casting. For instance, there are several grades of Die Slick for aluminum which meet every requirement, no matter how high the heat, how intricate the die, or how fast the rate of production. To find the correct grade for your operation, simply write, outlining what metal or alloy you are using, pounds of metal per shot, a description of the part, and special considerations. Order a week's supply of Die Slick and try it at our risk. If you are unsatisfied for any reason, return the invoice unpaid. Put Die Slick to work for you now!

Die Slick is a registered trade mark of G. W. Smith & Sons, Inc.

DIE SLICK

used by die casters everywhere

G. W. SMITH & SONS, INC., 1700 SPAULDING RD., DAYTON 3, OHIO

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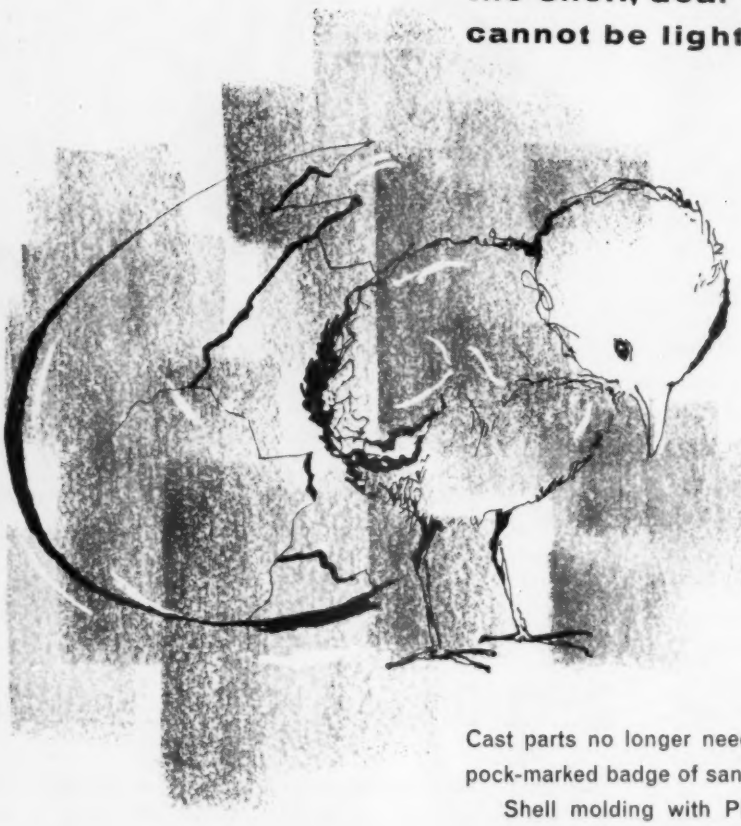
PLENCO SHELL MOLDING RESINS

the shell, dear friend, cannot be lightly dismissed



Cast parts no longer need emerge wearing the pock-marked badge of sand casting.

Shell molding with Plenco phenolic resins has made that rough-hewn appearance obsolete. Now, parts can be cast with smooth surfaces that require little or no polishing. And machining required is negligible, or often even completely unnecessary.

Plenco phenolic shell molding resins form light, dimensionally accurate molds. They are adaptable for most metals, even hard-to-cast ductile iron. And the molds are extremely durable.

The savings in time and money are easily apparent. Apply these economies to your production. Consult with Plenco about **your** product or product-problem.

PLASTICS ENGINEERING COMPANY

Sheboygan, Wisconsin

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

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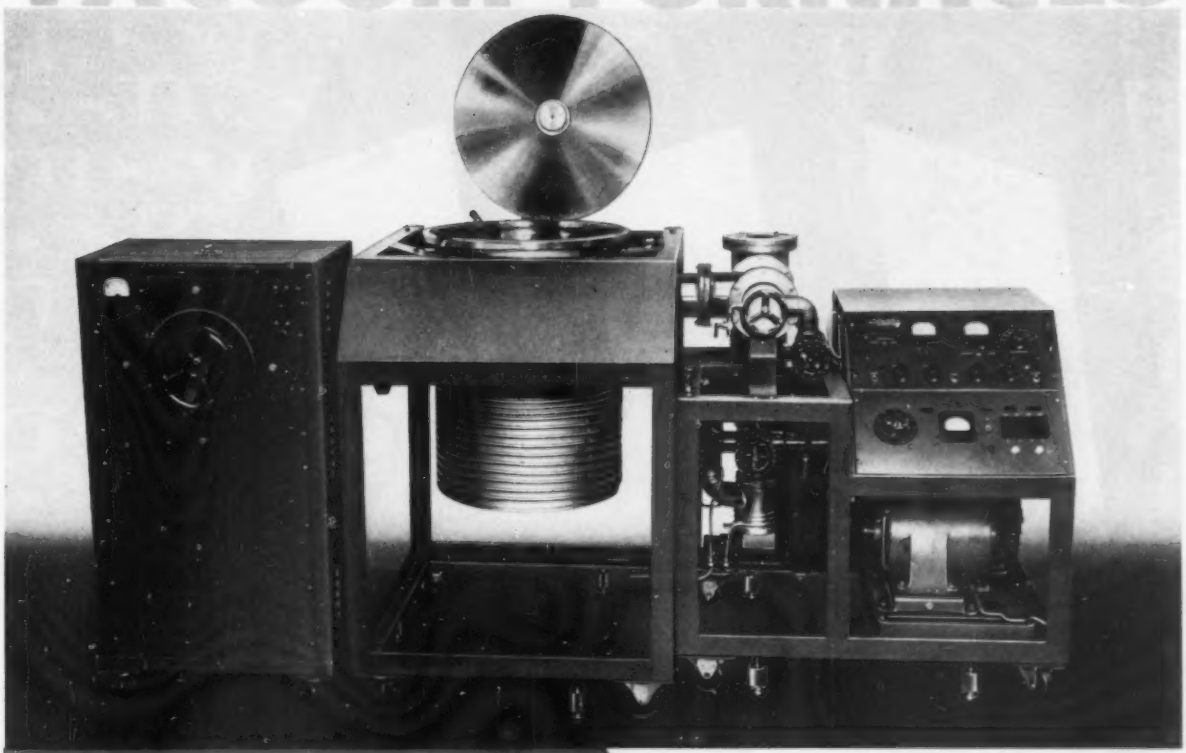
VACUUM FURNACES



NEW LABORATORY VACUUM FURNACE FOR SINTERING, ANNEALING AND MELTING

by Kinney®

The new KINNEY F-15 Laboratory Vacuum Furnace is an invaluable tool for research in metallurgy. It's designed on the modular principle to provide maximum flexibility and effect important economies as well. With simple modifications, problems of MELTING, HEAT TREATING, ANNEALING, ALLOYING, SINTERING, or even VACUUM EVAPORATING can be handled. As shown, a 15 KVA Packaged Power Unit is at the left and a KINNEY PW-400 Vacuum Pumping System at the right of the Furnace.

Several types of Induction and Resistance Heating Units may be employed in the F-15 Furnace and the Power Supply (7½, 15, 22½ KVA), will be that which suits the requirements of your operation. The furnace chamber, 18" diameter by 24" deep, is water-cooled and can handle up to 15 pounds of steel or equivalents in other metals. The F-15 may be employed for a broad range of metals work with Vacuum pressures to 1 x 10^{-5} mm Hg and temperatures to 2200° C. It may also be used for melting in inert gas atmosphere. To convert the equipment for High Vacuum evaporation a Bell Jar Assembly may be mounted on the Pumping System by disconnecting and rotating the valve 90°.

A comprehensive Line of KINNEY High Volume, High Temperature, High Vacuum Sintering, Annealing and Heat Treating Furnaces offers important advantages to you. Get the facts on the KINNEY equipment you need!

WRITE:

Complete information on new developments in KINNEY High Vacuum Furnaces is yours for the asking. Write today.

KINNEY MFG. DIVISION
THE NEW YORK AIR BRAKE COMPANY
3601M WASHINGTON STREET • BOSTON 30 • MASS.

Please send me information on KINNEY High Vacuum Furnaces for ☐ Research ☐ Sintering ☐ Annealing ☐ Melting.

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Company_____

Address_____

City_____ Zone_____ State_____

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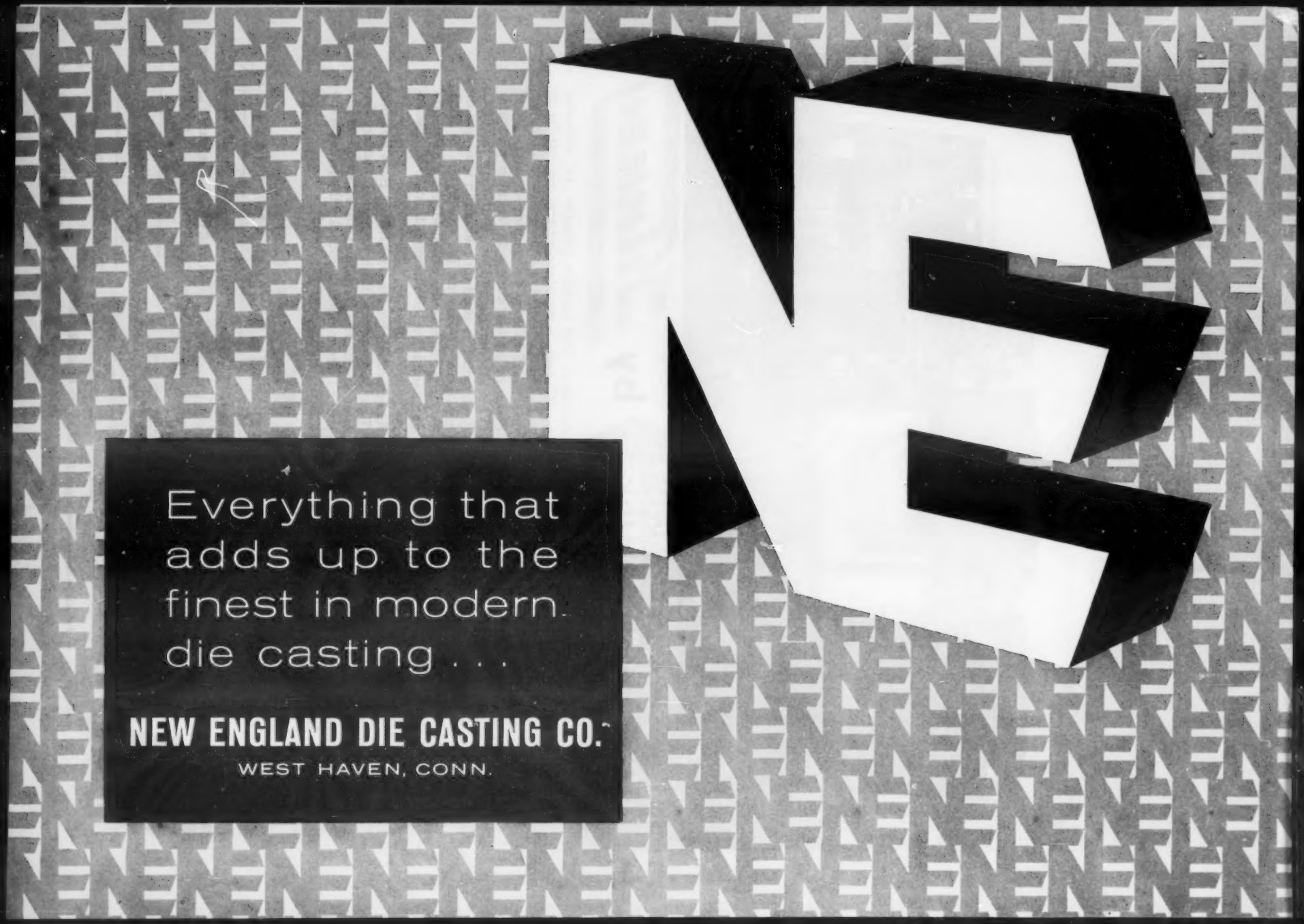

NE
Everything that adds up to the finest in modern die casting . . .
NEW ENGLAND DIE CASTING CO.
WEST HAVEN, CONN.

The Next Ten Years

By L. S. HAMAKER*

EDITOR'S NOTE: Short term business forecasts are of value in determining company activity and policy for the immediate future. Metal inventories, sales promotion, and similar activities can be guided by them.

When however, capital expense for equipment, buildings, long range sales planning and, in general, future production and marketing planning are considered, one must forecast with considerable accuracy over a much longer term than the coming year.

For the Precision Metal Molding Industries, there are a number of business barometers that might be used. All of these are moderately accurate, but none can predict the future as well as the steel industry. Rates of change may be different in, for example, the die casting industry, but as steel production rises and falls, so will production of die castings.

Further, the large steel companies must make predictions with very considerable accuracy for at least the coming ten year period and, in some cases, for the next twenty or thirty years.

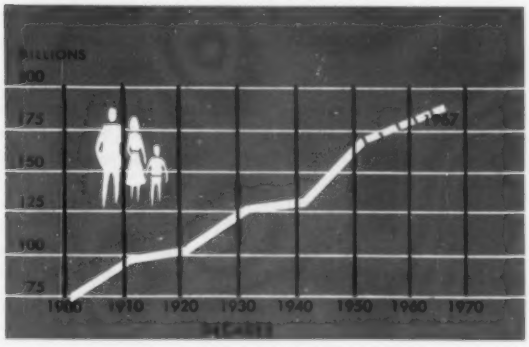
Because these market forecasts are so accurate and because of the close parallel between steel and the PMM industries, we have secured a ten year forecast for the steel industry from The Republic Steel Corp.

HISTORICALLY, the American system of growth is based on two factors: a rapidly growing population, and the investment of a large portion of company profits in research and development.

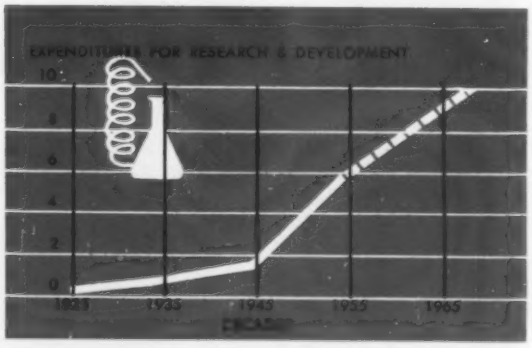
As the population expanded westward, the vision of linking both population centers and individual rural homes with a network of highways, electric power lines, telephones, telegraph lines, and most recently airlines, radio, and television became the American way of life.

Population growth alone would have furnished the material for an expanding economy.

*General Manager of Sales, Republic Steel Corp.



POPULATION GROWTH

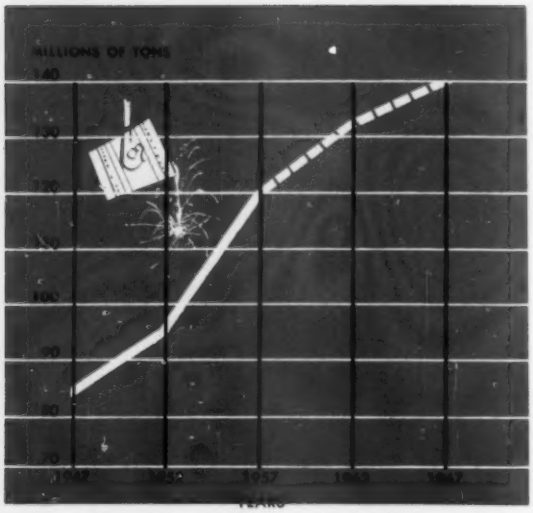


But along with this growth must be coupled the desire of a man to buy more than is required for bare subsistence levels. Thus his income had to be expanded by increasing productivity per man.

With increased productivity, an increase in leisure time created a demand for both luxuries and necessities and the need of spending for technological improvements.

The start of this massive spending for research and development was relatively slow but in 1955 reached $6 billion, and every indication points to a new high by 1965 of at least $9 billion.

Now let's look at a few typical industries to determine where they will go in the coming ten years.



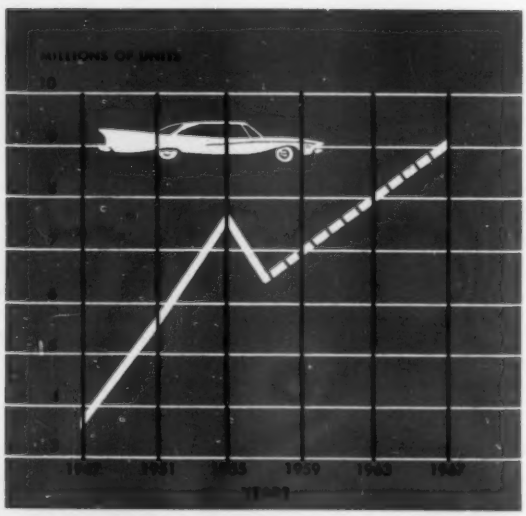
STEEL PRODUCTION AND CAPACITY

For the decade ending in 1965, the annual net gains in capacity are likely to be below the current rate. Capital spending, however, is expected to remain high because of the replacement of obsolete equipment whose retirement can no longer be postponed.

Steel capacity is expected to show strong net gains. By 1967, ingot capacity is likely to exceed 160 million ingot tons — and it will be capacity geared to meet the increasingly rigid requirements of our complex production machine.

Technological changes in steelmaking during this period may be more important in the long run than increases in capacity.

New products can be expected, also. Progress is encouraging in the search for heat-resistant coatings that will enable steel to withstand higher temperatures. New alloys are on the way, with special emphasis on alloys to withstand extremely high and extremely low temperatures.



AUTOMOBILE PRODUCTION

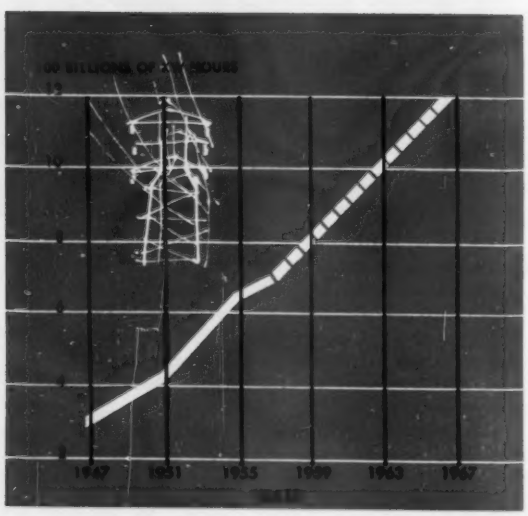
The automobile industry probably will be averaging sales of 8 million passenger cars and 1.4 million commercial vehicles in a single year by 1965.

There will be five million more people in the important 18-24 year age group; seven million more households, and 11 million more spending units in the $5000 and above income bracket. Not only will more people buy cars; more people will buy more cars. By 1965 there will be around 11 million two-car owners, an increase of over 100 percent.

There will be an increase in the use of plastics and lightweight metals, but steel will remain the bargain among metals, and the key material. Its strength and resistance to impact will offset its greater weight.

If expected engineering and metallurgical breakthroughs come in time, the gas turbine or the free piston engine will be replacing the reciprocating engine in some cars and trucks by 1965.

If the gas turbine wins out, there is likely to be a shift toward a much greater use of high-alloy, heat-resisting steels.



ELECTRIC POWER

The use of electricity in industry, by communities, and on the farm, approximately doubled during the past decade and is expected to double again by 1966.

Home use more than tripled during the decade and is expected to increase 2½ times by 1966.

Improved efficiency has reduced coal consumption from approximately 1.3 pounds per kilowatt-hour in 1946 to under eight-tenths pound per kilowatt-hour used today.

Part of the gain has come from improved design, part from better alloys permitting higher temperatures and operating pressures. There is some doubt that the present record-high temperatures and pressures can be economically raised.

A more likely possibility is that the gas turbine and the steam turbine will be linked together.

In one possible application, burning gases exhausted from the turbine will be used in boilers to produce steam for steam turbines.

Units such as this may be in use by 1965.

ELECTRICAL PRODUCTS

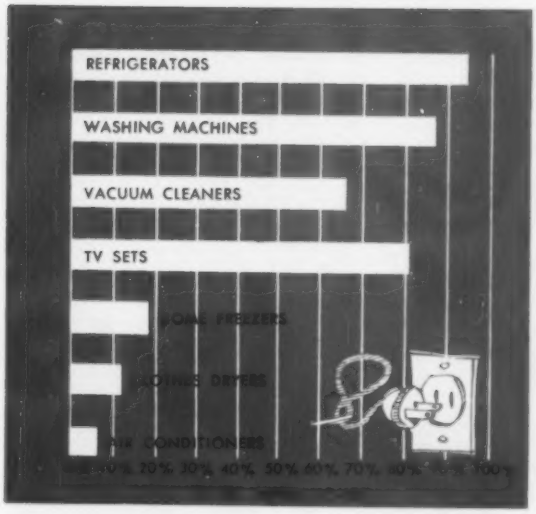
The total production of electrical goods is expected to follow the electric power trend of doubling or better each ten years.

Sales of electrical products rose from $6.1 billion in 1946 to $20 billion in 1956 and are expected to reach $40 billion or over in 1965.

Of special interest will be the development of new electrical and gas appliances. Dollar volume of electrical appliances is expected to rise from $8.4 billion in 1956 to $12 billion in 1965, with color television and air conditioning leading the way. Appliances now in "low saturation" will show rapid rises, and the appliances replacement market will continue to grow.

The "heat pump" to produce climate control will be the most spectacular advance for the home.

In lighting, the bulb and tube will give way to the "cold" light panel.



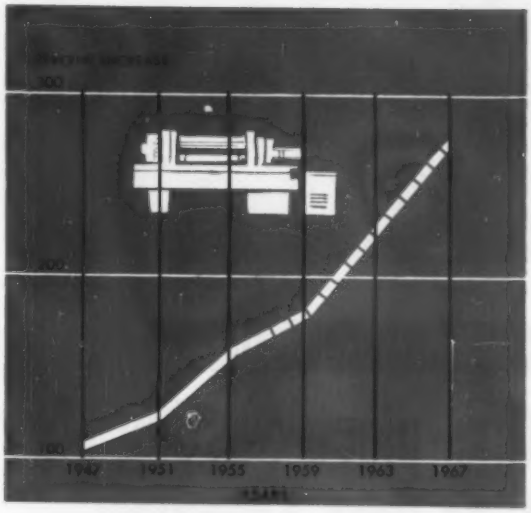
CAPITAL GOODS

Metal working equipment sales have always been closely tied to population, to expendable income, to product complexity and to technology.

In the years ahead the factor of technology may become of increasing importance. The total consuming population will rise faster than the labor force, and there will be a strong pressure on industry to put new technology to work on the production line.

The development of new materials with greatly increased hardness, tensile strength, and heat resistance will require new types of machines and need new machining processes.

Automatic and semi-automatic machines; faster, more accurate machines; machines linked by automatic transfer systems; machines with built-in testing and feedback control systems are certain to speed the normal obsolescence of much of our existing equipment now in use.



AGRICULTURE

Today's trend in agriculture is likely to continue with little change through 1965. Total farm population will probably decline. The number of farms will drop, but the average number of acres per farm will rise.

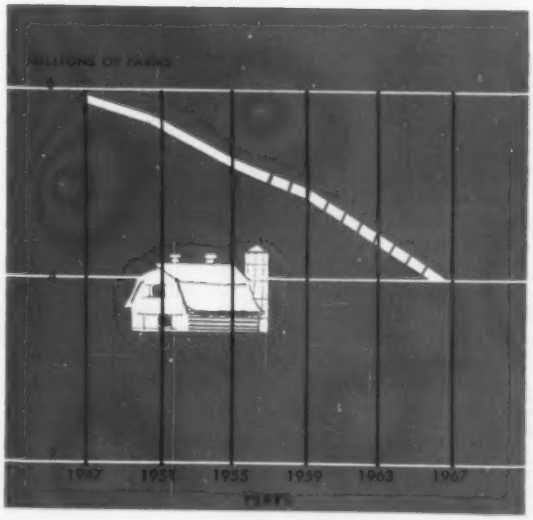
If present farm policies are still in effect over the period, gross farm income can be expected to rise from the present $33.4 billion to around $36 billion.

There will be fewer customers for farm equipment but their investment will be greater. Tractors will be of higher power, and more versatile.

But there is also likely to be a rise in specialized equipment, including self-propelled cultivators, planters and harvesting machines.

Sales of tractors and farm machinery are expected to increase in the early '60s, and by 1965 should reach a total of $2.1 billion.

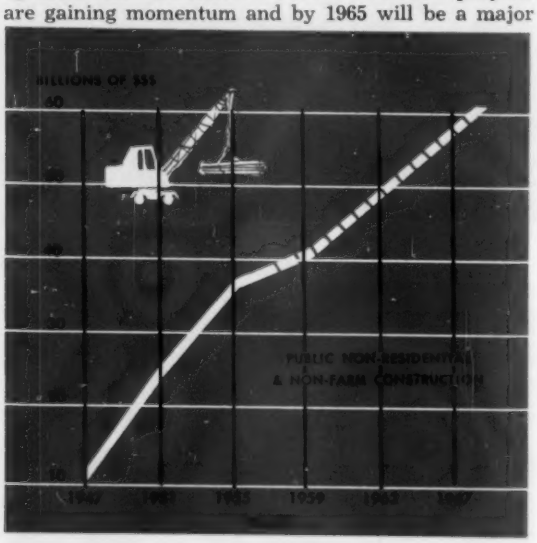
Farm construction is likely to show a decline through 1960, with a recovery by 1965 to around the 1955 rate of $1.6 billion per year.

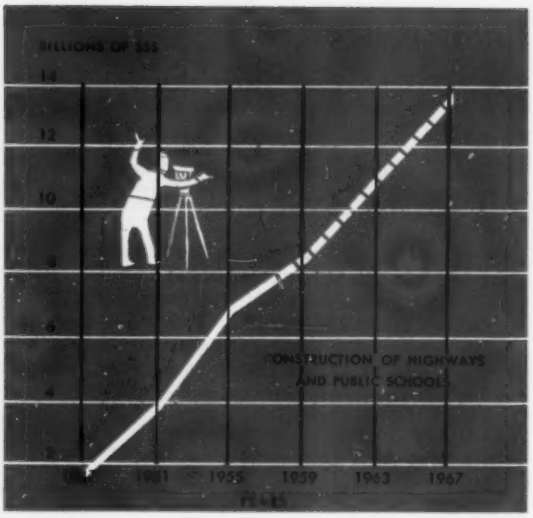


CONSTRUCTION

The construction industry — and the economy — is faced with a problem of truly enormous proportions: Meeting the demands of a country with a rapid population growth that is being paced by a parallel rise in the standard of living. Total new construction in 1956 reached $44.3 billion and is expected to approach $65 billion by 1965.

Housing, which has temporarily leveled off, will have to accommodate some 7 million new households by 1965. Slum clearance and urban renewal projects are gaining momentum and by 1965 will be a major





component of urban construction. Obsolescence will accelerate conversion and demolition. Demolitions, which are now running approximately 300,000 per year may increase to 400,000 per year by 1965.

Non-residential construction is expected to reach about $14 billion by the end of 1965.

School construction should double.

Highway construction expenditures, which exceeded $5 billion in 1956 are expected to reach $8 billion per year by 1960 when the full effect of the federal aid program is felt, and to remain at a high level through 1965 and beyond.

INVESTMENT CASTINGS

One-piece Casting For Nine Part Assembly

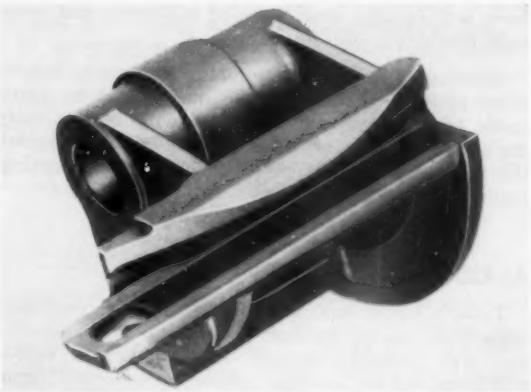
HOW much money can you save by using investment castings instead of high-priced assemblies welded and screwed together in a drawn out series of operations? Cold-fact figures straight from the Investment Casting Institute give us reliable statistics from which to judge and evaluate realistically.

The subject of this article is a shuttle lifter. It is a complicated piece used on a weaving machine and is very badly needed for the efficient operation of the textile industry.

The part is now made quickly and accurately by the investment casting method. One-piece, it slips neatly into assembly with no trouble.

But making it was once a complicated procedure involving these separate parts and their expensive finishing operations:

1. One sand casting.....Machined to size.
2. One stamping.....De-burred.
3. Three machined parts... Ground, milled, broached.



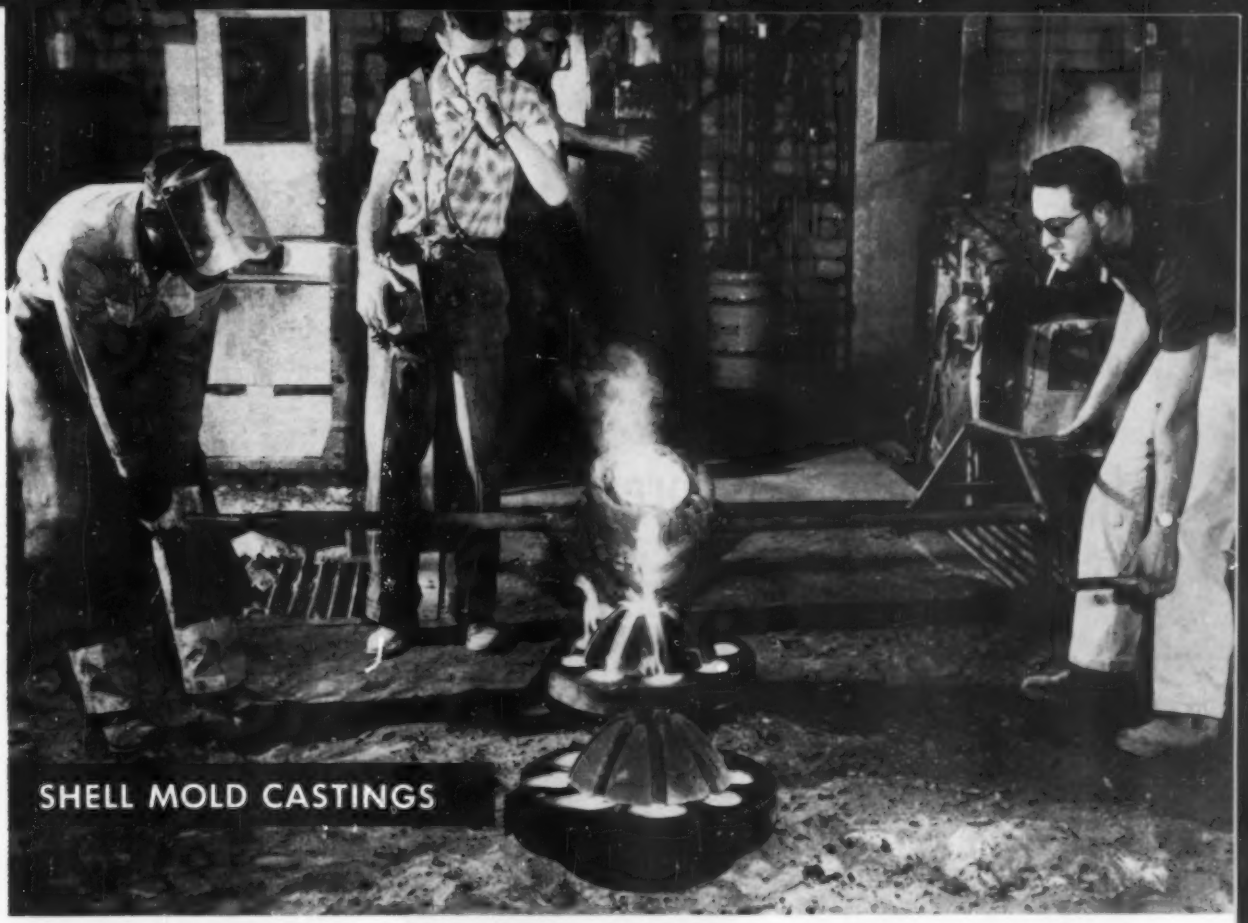
SHUTTLE LIFTER once made of many parts welded and screwed together, now investment cast.

4. Two machine screws... Inserted in assembly.
5. Two lock washers.....Inserted in assembly.

After all these various pieces were completed, they were screwed and welded together to make one heavy, clumsy assembly.

Since being re-designed as an investment casting, this part has been reduced in weight.

Now cheaper to manufacture, handle, and ship — and needing much less metal to produce, the cost reduction is an amazing 86%.



POURING STAINLESS STEEL into a shell mold. The foundrymen are using a bucket-type ladle and are casting an armored turbo hood flange in a shell mold bonded together with Bakelite phenolic bonding resins. Type 347 stainless steel is poured into the mold, making a part with a tensile strength of 75,000 psi.

Casting Stainless Steel Aircraft Parts

NOT a reject in 3,039 units is the record of shell molded stainless steel flanges for use in the aircraft industry.

This record was set in five months on production of Armored Turbo Hood Flanges, manufactured for The Martin Company by the Bakelite Company, Division of Union Carbide Corporation.

The parts are cast in thin shell molds and the resulting accuracy is such that machining has been virtually eliminated. The molds are produced from a mixture of sand and resin which forms a thin layer on a heated pattern. It is this light weight shell mold that holds the castings to the dimensional tolerances.

Excellent surface finishes were obtained on the engine flanges as well as on other parts.

The use of the phenolic bonding resins produces a mold of good hot rigidity, toughness, and strength. The porosity of these thin molds allows the gases to escape quickly. Results: *a better casting.*

Another advantage of using shell molds is they take up less storage and production floor space. The stainless steel castings, produced by this precision casting process, have a uniform directional strength and they will resist distortion under the heat of airplane engines. Bucket-type ladles are used to pour the molten stainless steel into the mold. Type 347 stainless steel, which has a minimum elongation of 35%, is used in the production of the flanges.

CASTINGS finished and crated for shipment. They are approximately 13″ in diameter. Their wall thicknesses vary from 1/8″ to as much as 5/16″.

An air-stable, easily compacted material is here.

Introducing, Commercial Titanium Powder

By ALFRED R. GLOBUS*

ALTHOUGH the science of powdered metal manufacture is quite firmly established with metals such as iron and copper, the production of a "problem" metal powder such as titanium powder is a different story.

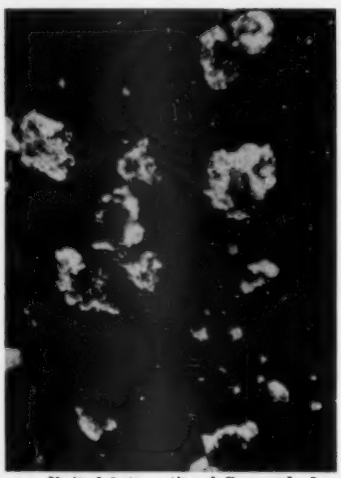
Unlike most other metal powders, titanium has offered the manufacturer and the processor a completely new set of problems which have severely delayed its commercial usefulness. Because of its properties, however, the industrial use of titanium powder on a large scale would benefit a great number of different industries.

For this reason, United International Research, Inc., which has been carrying on research and development work in chemistry and metallurgy since 1942, decided to tackle titanium powder production with a new process developed in its own laboratories.

As a result of almost five years work, United has made titanium powder available with a purity higher than 99%. It sells this powder under the trademark "UniFide" and it is being produced in quantities sufficient for commercial applications.

Unlike powders made from the decomposition of titanium hydride or by the disintegration of titanium sponge, this powder consists of tiny individual sponge-like particles which offer excellent compressibility. This sponge-like characteristic gives the product high green strength and its large surface area makes it an ideal catalyst.

*Director of Research, United International Research, Inc., Long Island City, New York



United International Research, Inc.

TITANIUM POWDER — 100 mesh magnified approximately 65x.

This large reactive area should make the powder highly pyrophoric but its most important property is its stability in air. It is a characteristic of titanium powder, particularly in the fine mesh sizes, that it is usually spontaneously flammable and is shipped under water, thus requiring processing before it can be utilized.

This inherent instability also necessitates care in handling and storage, making its industrial use somewhat precarious. "UniFide" titanium powder, on the other hand, appears to be stable, showing no tendency to spontaneous combustion or to easy oxidation when exposed to air.

On a sample of -325 mesh "UniFide" titanium powder, tests made by Wright Air Development Center showed a 0.03% oxygen content. After three months exposure in an open beaker, the oxygen content was only 0.05%.

This stability seems due to the tendency of the oxygen content to concentrate in the surface molecules of the particle as a sub-oxide, probably Ti•TiO. This tends to protect the particle of titanium against further oxidation below the surface.

This tendency is characteristic of the process which forms a loose agglomeration of powder that is later broken apart, washed and screened.

This process, which starts with titanium dioxide, goes through several intermediate steps to form a low melting bath in which the metallic agglomerate is formed, largely adhering to the wall of the cell. While the process was a two stage electrolytic one as originally conceived, this has been entirely supplanted by a much more efficient process involving a chemical electrolytic process with the secondary phase.

Recoveries are good, ranging from 60% to 70% in terms of the original TiO_2. When the agglomerate is broken up, a considerable amount of fines are produced which are being converted into various compounds such as titanium iodide and fluoride on an experimental basis. No decision has been made on their ultimate use.

A number of serious problems were encountered in preparing the final powder.

It was found that after the final washing, any endeavor to dry the powder resulted in oxi-

TITANIUM SINTERING made by the new process. Its detail can be seen in the enlarged photo above. An idea of its precise construction and actual size can be gained by comparing the part to the ruler.

dation because of the adsorptive characteristic of the powder.

A purging technique using the vapor of a hygroscopic organic vapor at low temperatures on a countercurrent basis was developed which, in combination with a vacuum, left the powder moisture free and without oxidation. This technique, though somewhat costly, appears to be the only method for preventing an increase in oxygen content during this stage. This technique also offers promise for producing other sensitive metal powders.

All processing is done under argon which is used to purge all lines before starting. Originally, consumption of argon was high but improvements in equipment construction have enabled us to decrease the original argon consumption by over 75%.

The powder produced by the process is a uniform dark gray with a metallic glint from the individual crystals. Based on the −100 mesh, as an example, it will run a maximum of a 0.2% oxygen with less than 0.1% nitrogen; iron from 0.05% to 0.1%; total heavy metals as lead, less than 0.08%; light metals as aluminum, magnesium, and sodium, less than 0.25%.

As produced, the powder has a considerable quantity of occluded, not combined, hydrogen, often running 0.2%. Degassing under low vacuum at a dull red heat of 500° C removes 75% to 80% of the hydrogen without sintering. It may be freed from hydrogen if desired by heating at low temperatures under a high vacuum. For many purposes the hydrogen is advantageous but is removed when pressed parts are sintered in vacuum.

The high purity of "UniFide" combined with its compressibility, high green strength, and stability in air, provides a combination of properties which make it ideal for a wide range of industrial applications.

Self evident is its use for the manufacture of cams, gears, wheels, and other parts requiring high density, since it can be compressed to almost 100% density if desired.

For this purpose, pressures of 45 tons to 60 tons psi are recommended with sintering at temperatures of from 2250° F to 2500° F with at least one hour's soaking time. On the other hand, it can be made into porous parts such as filters and aerators with any desired porosity. Its excellent chemical resistance makes it ideal for handling or contact with highly corrosive agents. Its use for filtering fuming nitric acid is an example.

"UniFide" titanium powder may be incorporated into other metal powders such as cobalt, nickel, iron and copper to form alloys. The porous nature of the particle facilitates alloying. Carbon and boron may be added to harden the titanium alloys if desired. In this manner, abrasion-resistant products or abrasives may be produced. Brake linings and sand blasting nozzles may be made in this way.

The coarser mesh size may be used as a deoxidizing agent when added directly to copper or copper alloys. The finer particle-size makes excellent protective pigment when incorporated into suitable vehicles. These fine powders may also be incorporated into welding rods.

Among very important uses we are beginning to exploit are catalystic applications. Readily formed into pellets, rods and other forms, inherent porosity allows for large contact area. Because of the multiple valences which characterize titanium, its utilization as a cata-

Continued on page 79

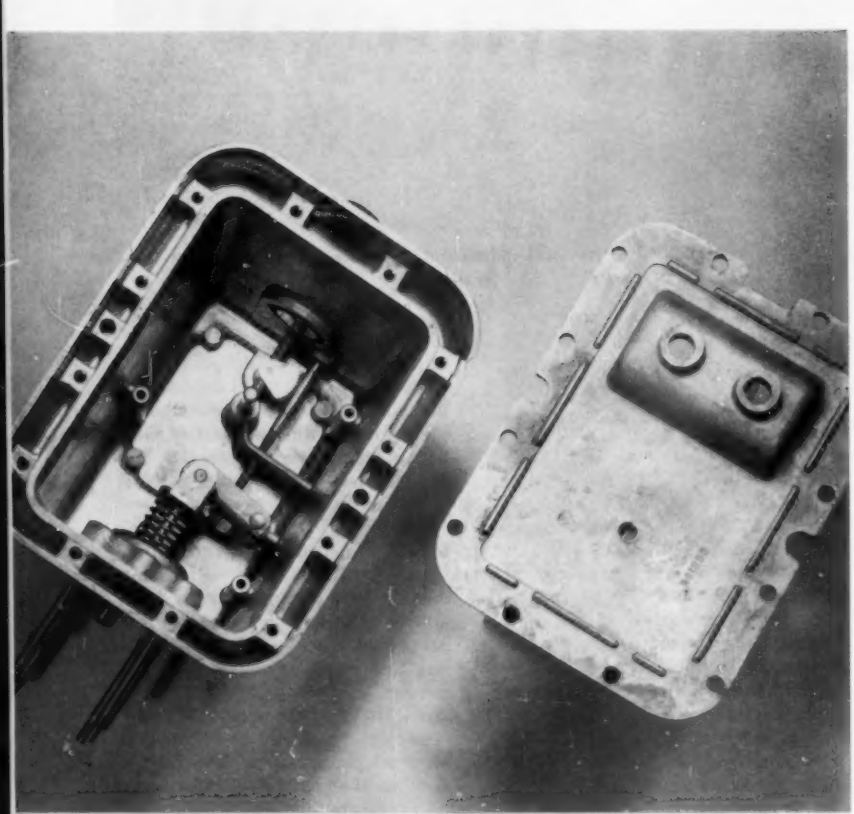
DIE CASTINGS

COVER STORY

Here is how this manufacturer was able to save money and speed up production by . . .

Designing For Aluminum Die Castings

BY R. G. MURPHY*



1. REVERSE SIDE of the die-cast main case. A groove is seen which has been cast in around the case. It is complete with the exception of small bosses that are needed to accept machine screws.

CONTRARY to popular belief, there is no such thing as pure water in nature. The danger of pollution to water supplies is always present. Springs and wells often considered to be pure are subject to contamination from seepage and drainage through soil or rock, sometimes from several miles away. Purity, therefore, cannot be taken for granted and continual protection must be provided. For farms, camps, motels, and other small rural habitations, the usual chlorinating system is far too expensive and too elaborate an installation to allow its use. Further, many of these places are located where a supply of liquid chlorine is either completely unavailable, or, at best, very difficult to secure.

To provide the protection needed, Wallace & Tiernan, Inc. has developed a small hypochlorinator which uses common household bleach as a source of chlorine for purifying water. One of these complete units, ready to be hooked up to a pumping system, is shown in figure 3.

In order to keep the cost of this apparatus as low as possible, it was designed originally to be made almost entirely of aluminum die castings. There are five castings involved in the unit. These are shown in figs. 1 and 2.

Before discussing the individual castings which go to make up this unit, a brief description of how it works is important. The basic unit consists of a motor-driven diaphragm pump so arranged that by varying the length of stroke on the arm which operates the diaphragm, the amount of hypochlorite solution which is drawn from the supply tank and injected into the water supply system can be controlled. The frequency with which the pump operates is fixed by a constant speed induction motor geared down to the desired number of strokes per minute. The motor serves only to actuate the pump diaphragm in one direction and return is by spring action. All parts of the chlorinator coming in contact with hypochlorite solution are plastic or rubber.

As can be seen in figure 3, the main case is a single die casting, aluminum in this case, the reverse side of which can be seen in figure 1. Because the motor and diaphragm actuating mechanism must run in an oil bath, this case must be oil-tight.

Originally the castings were made in No. 43 alloy in order to secure the thin wall desired. Considerable trouble was encountered due to porosity of these castings. Based on recommendation of the Parker White Metal Company who make the castings, a change

*Manager, Engineering Services, Wallace and Tiernan, Inc.

was made to No. 380 alloy. This is a high-silicon material with a considerably better castability. Since the change there has been no trouble with porosity.

In the view of the case showing the underside, it will be observed that a groove has been cast in completely around the case except for small bosses to accept machine screws. This groove is a metal saving device and improves castability.

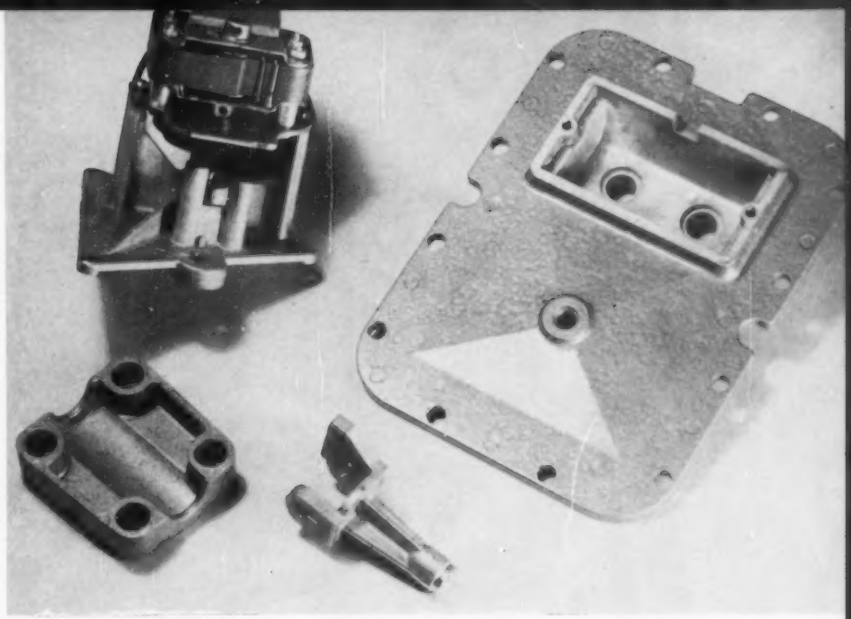
The base casting or cover casting functions as a sump and drain and carries a power inlet box. By shaping the bottom plate as shown in figure 2, adequate drainage to a single point is secured and a tapped hole closed with a pipe plug is all that is required. No surfacing operations on either the bottom of the main case or on the base plate are required, since the foundry is able to cast these sufficiently flat so that with a gasket there is no oil leakage.

Two knurled holes are cast in the conduit box and the wires carrying power to the motor pass through them. Plastic terminal seals, molded onto the wire, form an oil tight seal.

Examination of the underside of the main casting shows that bosses have been cast in on which the motor is mounted. In addition a boss is shown in which a steel shaft is inserted. This shaft carries the combination main gear and cam which actuate the pump diaphragm. The motor is shown in figure 2.

This aluminum casting is made complete with all holes cored except those for motor mounting, gear shaft and oil level indicator. These holes are jig drilled in order to secure proper positioning and alignment. The cam and main drive gear (not shown) operate against a steel roller that is positioned in a small die cast arm, shown in figure 2. This arm is the main actuating mechanism for the diaphragm and is the only member of the assembly which carries any considerable load. It must be able to take the full thrust against the return spring to move the diaphragm forward and, in turn, must take the shock loading when the spring returns the diaphragm to its normal position. An aluminum die casting has been found fully adequate for this service.

The final casting used in this chlorinator is a cover cap which



2. ALUMINUM DIE CASTINGS were originally specified by designers of the chlorinator in order to keep costs as low as possible.

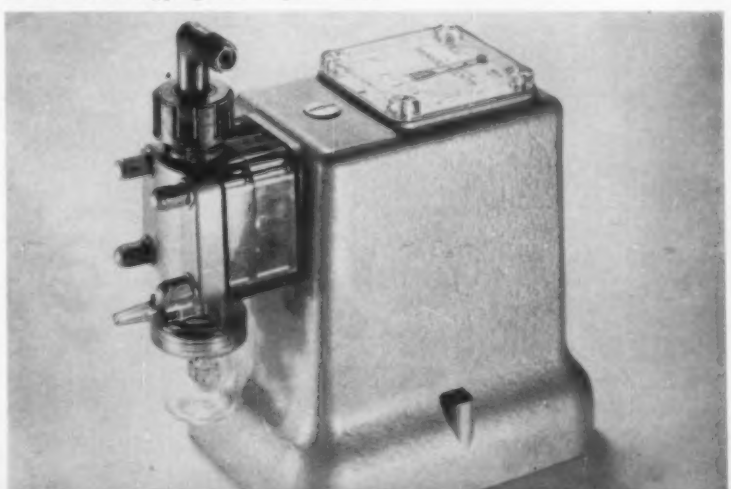
mounts in front of the plastic members and whose sole function is to clamp the various portions of the plastic pump body to the main hypochlorinator casting. Again a die casting is used for this purpose, and this casting requires surface finishing.

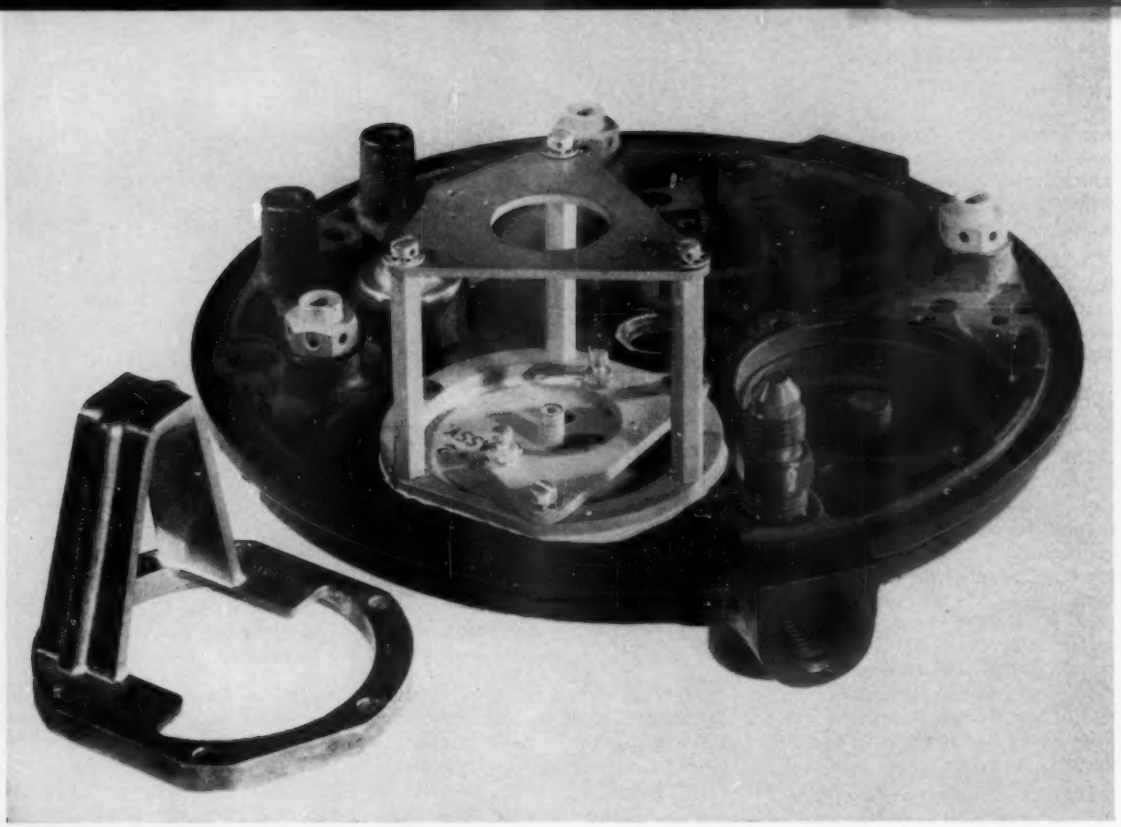
Surface finish on the chlorinator is with a gray hammertone enamel. The aluminum parts which are to receive the enamel are degreased, cleaned, and Alodized. (This is a proprietary surface preparation treatment developed by the American Chemical Paint Company). After Alodizing the parts are rinsed and dried, and then sprayed with gray hammer-tone enamel. Two coats are used, a primer and top coat, both of which are in modified alkyd vehicles. Each coat is baked after application.

Earlier, mention was made of the fact that all portions of this chlorinator were designed originally as die castings. However, the first 25 units made employed grey iron sand castings, and while they admittedly were only prototype units, it became very evident that iron castings would not be suitable. The change was made to aluminum die castings to reduce machine work and cost and to improve the surface finish.

The change from cast iron to aluminum gave another benefit in lowering shipping charges materially. Not only was there approximately a 3-to-1 differential due to the difference in specific gravity of the aluminum and the cast iron, but by using the die casting process, it became possible to make the main housing and the cover plate much thinner than could be cast in any other way, so that the completed Chlorinet (Registered Trade Mark) probably weighs less than one-fourth as much as one made from machined iron castings.

3. COMPLETE UNIT ready to be used for chlorinating. The main case seen here is a single die casting made of aluminum. Using the lighter metal in place of cast iron cut shipping costs a great deal.





COST SAVINGS readily available to the manufacturer who revamps his assembly and components to the use of one or more investment castings, are often hidden under the false figures of old-fashioned book-keeping. The casting seen here was almost passed by until a close examination of all costs revealed a hidden saving of 71%.

INVESTMENT CASTINGS

Probing Reveals Hidden Cuts in Cost

By Scholar Bangs, Western Editor

WITHOUT doubt, many investment casting jobs have died on the drafting board, killed by early discovery of hidden buried costs.

A little deeper digging into costs might have revealed hidden savings which far offset the alarming cost figures.

AiResearch Mfg. Co. of Los Angeles, a division of The Garrett Corp., making cabin pressurization systems for all types of aircraft, offers a striking example for analysis.

During a production simplification survey, company design engineers studied a cabin-pressure regulator "black box" in which two small pedestals supported a delicate regulating mechanism.

Each pedestal was a built-up assembly of ten parts: base plate, base ring, stud, three support pillars, three A/N screws, and a top plate.

Could the parts-heavy pedestal be replaced by a single casting?

For an answer, AiResearch engineers came up with a prototype casting — and also the bad news.

The casting could be had for one-fifth the cost of the ten parts in the built-up pedestal. But there were finishing operations such as: belt-sanding one surface, drilling two holes in the pedestal head, and counter-sinking one hole for an attachment screw. These would raise the unit cost to 43% above the cost of parts in the built-up unit.

With two pedestals assigned to each regulator, and the unit in mass production, the prospective "loss" in the contemplated switch to a casting was staggering.

At this stage, some production planners might have decided: "We'll stick with what we have."

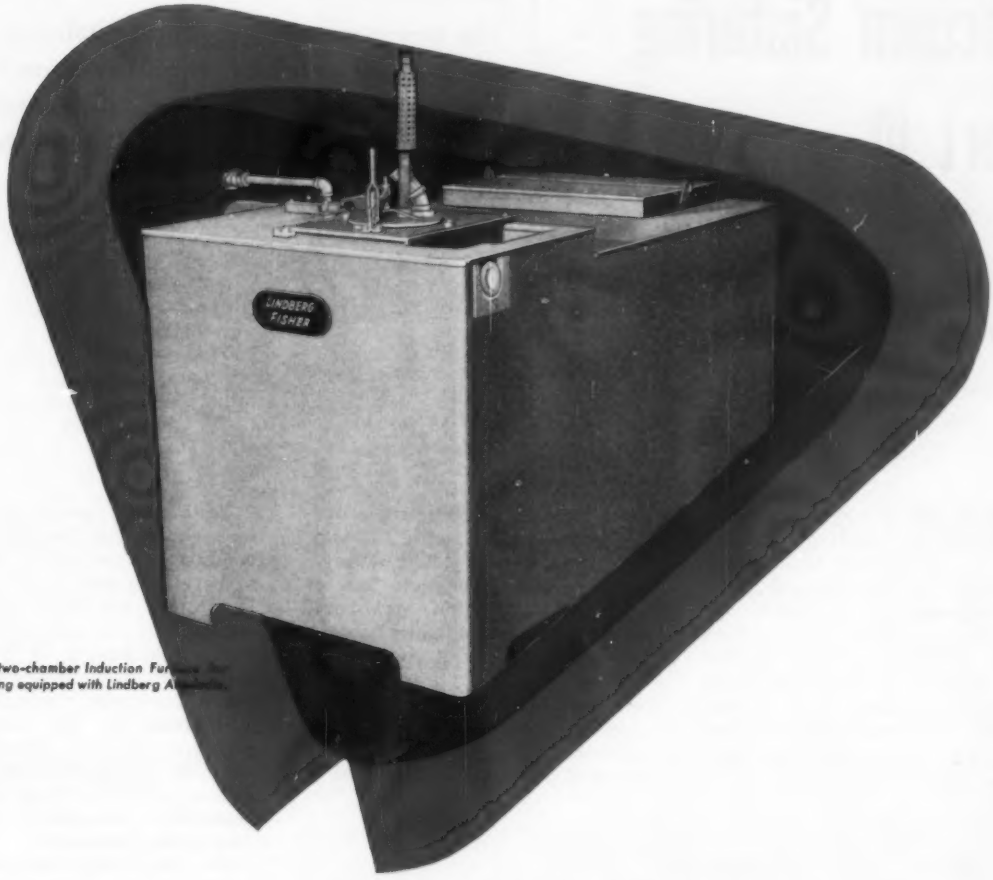
Investigators were not satisfied, however. They probed ahead in their cost figuring, and found a "joker" in labor charges.

Time studies disclosed that the cast pedestal could be mounted in the pressure regulator box for 29% of the cost of assembling the ten parts of the built-up device, a 71% saving.

Combined costs of the cast pedestal including basic casting, finishing, and assembly, would reduce by 30% the total cost of the completed regulator.

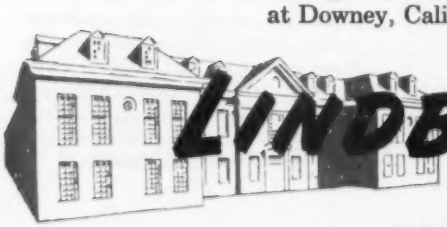
The unit cost reduction multiplied by two (there are two pedestals per unit) and then multiplied by the mass production, resulted in the prospect of saving thousands of dollars per year in the production of this one item.

Here's the ideal combination for casting aluminum automatically



Lindberg-Fisher two-chamber Induction Fur... melting and holding equipped with Lindberg A...

Do you die-cast aluminum? Then take Lindberg's famous two-chamber induction melting and holding furnace, add "Little Joe" Lindberg's new automatic pump, and you'll have the most efficient automatic combination anywhere. The Lindberg-Fisher two-chamber furnace *melts* in one chamber, *holds* metal at precisely the right temperature in the other chamber, and "Little Joe" automatically delivers exactly the right size shot to the casting machine. With this combination all handling of molten metal is eliminated, perfect control of metal temperatures and shot size is maintained, and all automatically. For safer, more economical, more precise handling of aluminum or any non-ferrous metals or alloys better see Lindberg. Just get in touch with the Lindberg plant or the Lindberg Field Representative in your locality, or write Lindberg-Fisher Division, Lindberg Engineering Company, 2463 West Hubbard St., Chicago 12, Illinois. Los Angeles Plant: 11937 S. Regentview Ave., at Downey, California.



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SINTERINGS

Vacuum Sintering Part III

The newer metals; beryllium, titanium, zirconium and uranium require vacuum techniques for the best powder fabrication results. In this final section on vacuum sintering, the author explains why.

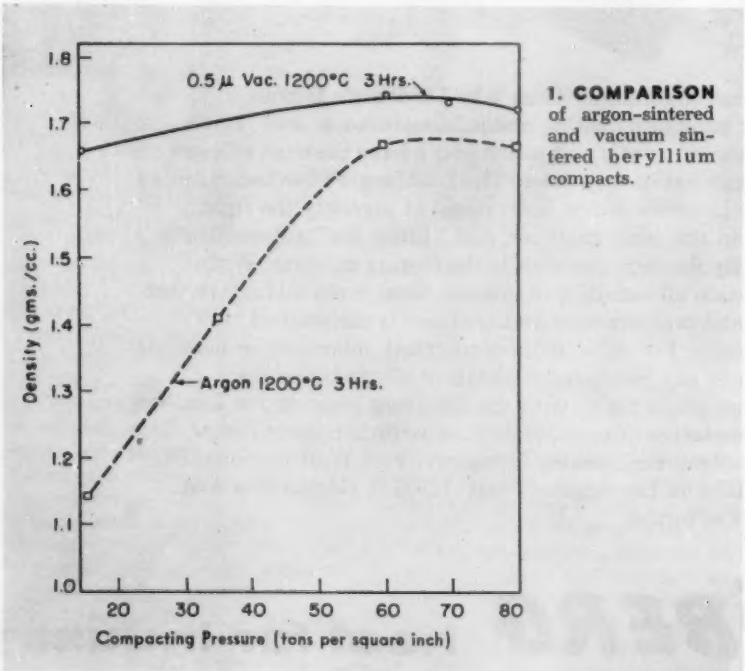
By **HENRY H. HAUSNER***

EFFECTS OF EVAPORATION AND CONDENSATION

It is interesting to compare sintering in vacuum and other atmospheres respectively, especially for metals with a high vapor pressure, such as beryllium. Most of the beryllium metal presently in use is made by the powder metallurgy method of hot pressing beryllium powders.

The metal obtained in this way is characterized by high density, and an almost complete lack of ductility. Beryllium powders, cold compacted and subsequently sintered in a neutral atmosphere, do not result in a highly dense material even if the compacting pressure is high and the sintering temperature is very close to the melting point of the material.

*Vice Pres., Nuclear Eng. Div., Penn-Texas Corp.



1. COMPARISON of argon-sintered and vacuum sintered beryllium compacts.

Tests made several years ago have shown that the atmospheric conditions under which sintering of beryllium occurs are of great importance and affect the sintering process very strongly. Fig. 1 shows the density of beryllium powder compacts sintered in argon and vacuum, respectively, as a function of the compacting pressure. Vacuum sintering results in higher densities than does argon sintering, an effect especially pronounced at low compacting pressures.

The reason for this phenomenon is probably as follows: Whereas sintering, i.e., bonding between metal powder particles and densification of the compact, is usually determined by mechanisms such as surface and volume diffusion, an additional sintering mechanism takes place during sintering of beryllium — namely, evaporation and condensation.

This mechanism, however, will be effective only by sintering the beryllium compact in vacuum. The less the compacting pressure, the greater the porosity of the compact, the greater the exposed surface of the beryllium powder particles, and in consequence more material will evaporate from the surfaces and condense again around the contact points between the particles. This evaporation and condensation process, however, is hardly effective when sintering occurs under atmospheric pressure in a

protective gas such as argon.

Condensation of the beryllium vapor around the contact points increases the contact areas between the beryllium powder particles without contributing to the densification, but, inasmuch as the vapor deposition increases the contact areas, the electrical resistivity of the compact decreases as shown in Fig. 2. The sudden drop of electrical resistivity at a temperature between 600° C and 700° C can only be explained by the existence of evaporation and condensation as a sintering mechanism.

This additional sintering mechanism also affects nucleation and recrystallization conditions and therefore the microstructure of the sintered material. Vacuum sintered material is characterized by a smaller and more uniform grain size. Besides this, the argon-sintered material is hopelessly brittle, whereas the vacuum-sintered material shows some indications of ductility; it can be cold rolled approximately 10%, then annealed and cold rolled again. During cold rolling, the characteristic twins form, the number of twins increasing with more reduction of cold rolling.

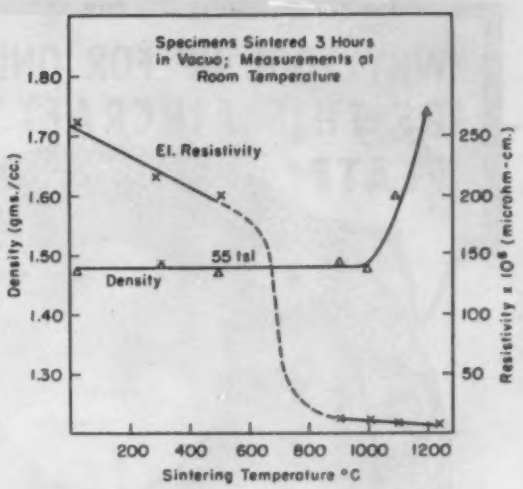
HYDRIDE DECOMPOSITION DURING SINTERING

Zirconium is one of the metals best suited for powder metallurgy applications. This is especially true when sintering occurs in vacuum. However, before this subject is discussed, a few words should be said concerning the preparation of zirconium powder.

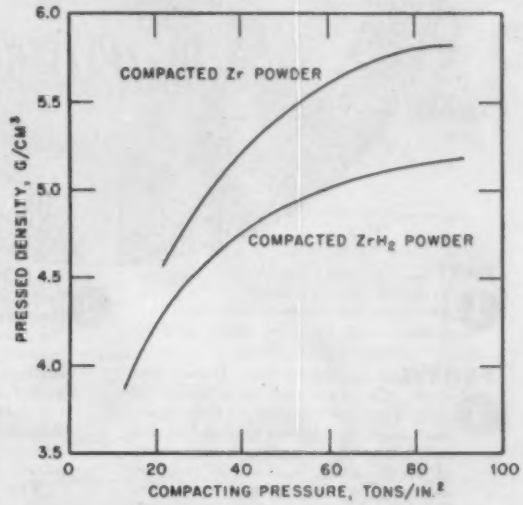
Although zirconium powders can be made by electrolytic, reduction, and leaching processes, we will concentrate in this discussion on zirconium powders made by the decomposition of the hydride. Zirconium hydride is made by passing hydrogen over zirconium irrespective of whether the solid zirconium is made by the Kroll process (sponge zirconium) or by the DeBoer process (crystal bar zirconium).

The temperature most suitable for hydriding these materials is approximately 800° C. At this temperature the lower hydride, ZrH, forms. During cooling from

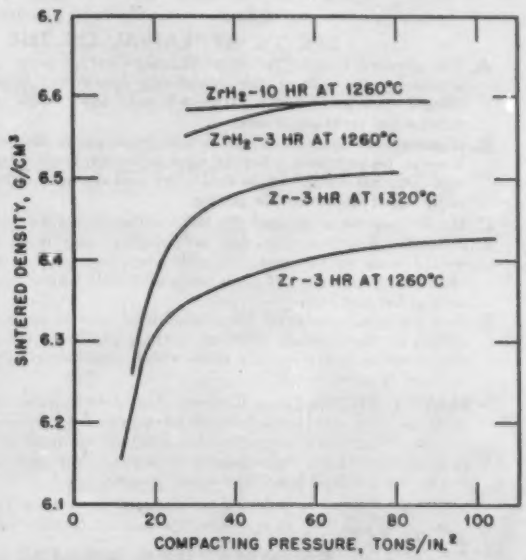
Continued on next page



2. EFFECT of sintering temperature on density and electrical resistivity of beryllium.



3. EFFECT of compacting pressure on the pressed density of compacted zirconium and zirconium-hydride powders.



4. EFFECT of compacting pressure on the sintered density of pressed and sintered zirconium and zirconium-hydride powders sintered in a high vacuum.

WHY TOOL UP FOR ONLY 8 PIECES OF THIS AIRCRAFT FRICTION PLATE

ACTUAL SIZE

PART — Friction Plate— Type 410 Stainless Steel, Rockwell C-45, serrations 1/16 deep, points must be sharp and in same plane within .010.

PROBLEM — Machining from bar stock was slow and prohibitive in cost. Customer would like to make part as an investment casting but did not know if a casting would meet physical and functional requirements. They hit upon a good idea for obtaining test castings in a hurry —machine a few parts from polystyrene plastic and use them for making investment castings.

FOLLOW UP — We agreed that their idea was good and advised them that we could make the casting. We were ordered to proceed, but, instead, we gave the matter some further thought and as a result prevailed upon our customer to order temporary wax injection tools even though the initial cost was higher and four additional days were to be added to delivery time.

What did we have the foresight to think of that convinced our customer to extend precious delivery time and authorize a greater expenditure?

EPCO'S APPRAISAL OF THE PROBLEM

A. The greatest cost by far in producing castings from machined polystyrene patterns would be the cost of the machining operation. If polystyrene patterns were machined incorrectly, new patterns would have to be made with a loss of time and substantial increase in cost.

B. If parts were miscast or gating was inadequate, the entire cost of the process would have to be repeated whereas once injection tools were made, the cost of producing wax patterns would be insignificant and enough patterns could be made to permit some experimentation in gating.

C. If castings were spoiled by the customer before tests were completed or if additional parts were needed to complete the tests, the whole laborious process would have to be repeated with the same gamble against machining errors and chances of miscasts. If tools were available, more castings would be quickly available at far less cost.

D. Test castings produced from machined plastic patterns would only prove acceptability of the castings whereas castings produced from conventional tooling would also serve to prove out the tools which could then be used for production purposes without further delay.

HAPPY ENDING — Test castings were satisfactory and we used the original tools to rush out several hundred pieces for our customer's production requirements. What was the cost of this original tooling? — less than 10% more than the cost of machining eight plastic patterns. Was any time saved? — Production delivery was made at least four weeks sooner.

Solution of thought provoking casting problems come easy to us. You are invited to take advantage of our experience.

EpCo **ENGINEERED PRECISION CASTING CO.**
HIGHWAY #79, MORGANVILLE, NEW JERSEY

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VACUUM SINTERING

continued from page 45

this temperature in hydrogen, another hydride, ZrH_2, forms at approximately 400° C. Zirconium hydride is a solid material of great brittleness which can be mechanically comminuted to a powder of any desired particle size without any difficulty.

The zirconium hydride powder can be converted into zirconium metal powder by decomposition in vacuum of 0.05 microns or better, at a temperature of approximately 800° C. Both powders, ZrH_2 as well as Zr, compact to fairly high densities at conventional compacting pressures, as shown in Fig. 3. Although the strength of the zirconium hydride compact is less than that of the zirconium compact, the hydride compact is still strong enough to be handled. The modulus of rupture of the "green" compact pressed at 50 tsi is 1700 psi for compacts made from zirconium hydride powder, and approximately 3500 psi for zirconium metal powder compacts.

Both types of compacts, those from zirconium powder as well as those from zirconium hydride powders, can be sintered. Whereas zirconium metal powders can be sintered in a neutral atmosphere or in vacuum, zirconium hydride powders must be sintered in vacuum exclusively.

During sintering of zirconium hydride compacts in vacuum, the hydride decomposes and the zirconium hydride particles transform to zirconium metal and the hydrogen evolves. The decomposition of the hydride occurs at approximately the same temperature at which bonding starts between the zirconium particles. For practical purposes, we may say that both processes, decomposition and the beginning of bonding, take place at approximately the same temperature.

During decomposition of the hydride the zirconium atoms are in an accelerated state and vibrate at amplitudes which correspond, without decomposition to amplitudes of thermal vibration which are characteristic for considerably higher temperatures. This accelerated state of atomic vibration is probably the reason why sintering, i.e., bonding and densification of the decomposed zirconium hydride compacts, occurs already at fairly low temperatures.

Continued on page 69

DIE CASTINGS

ADVICE TO DESIGNERS WHEN THEY ASK . . .

"Is Space Scarce?" Use Zinc Die Castings!

THIS particular motor-governor is designed to fit a small space between the motor-drive housing and the keyboard section of the Burroughs series "P" desk model adding-subtracting machine.

It is an excellent example of the designer's adjustment to the dictum: In *all* business machines, *space* is at a premium.

Zinc was selected as the metal to be used for the die casting. Why?

Because of these important factors:

- Economy in production
- Ability to hold close tolerances
- Less thin-core maintenance needed
- Greater speed of production
- Greater strength

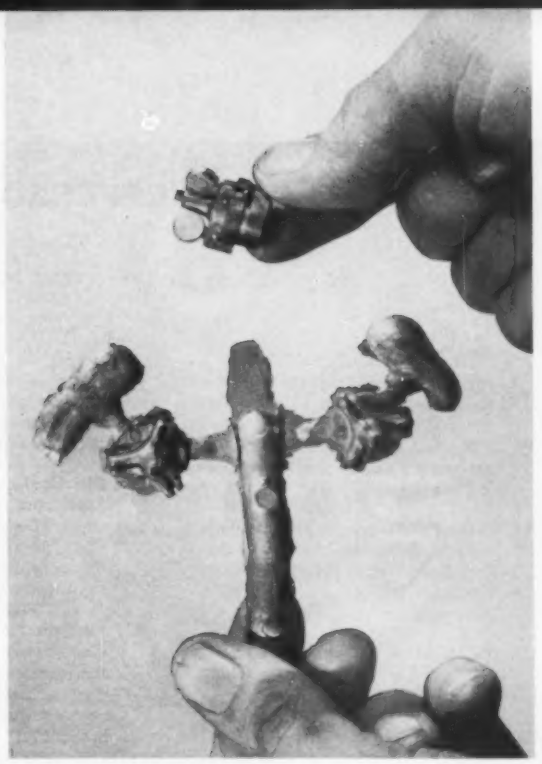
Parts which make up the completely assembled motor-governor are made of both steel and zinc. steel. The fly-weights which give it the necessary balance required of a dependable governor, are carefully

The pins which help hold it together are made of made of the same metal.

The actuating pin is the third part fabricated in steel and assembled into the motor-governor.

The zinc die castings are made on a small die casting machine. This machine has a production rate of 144 close tolerance die castings per hour.

The casting-manufacturer's engineers have calculated the yearly production rate at 50,000 castings and they feel there will be a very low rejection rate when the governors are inspected.



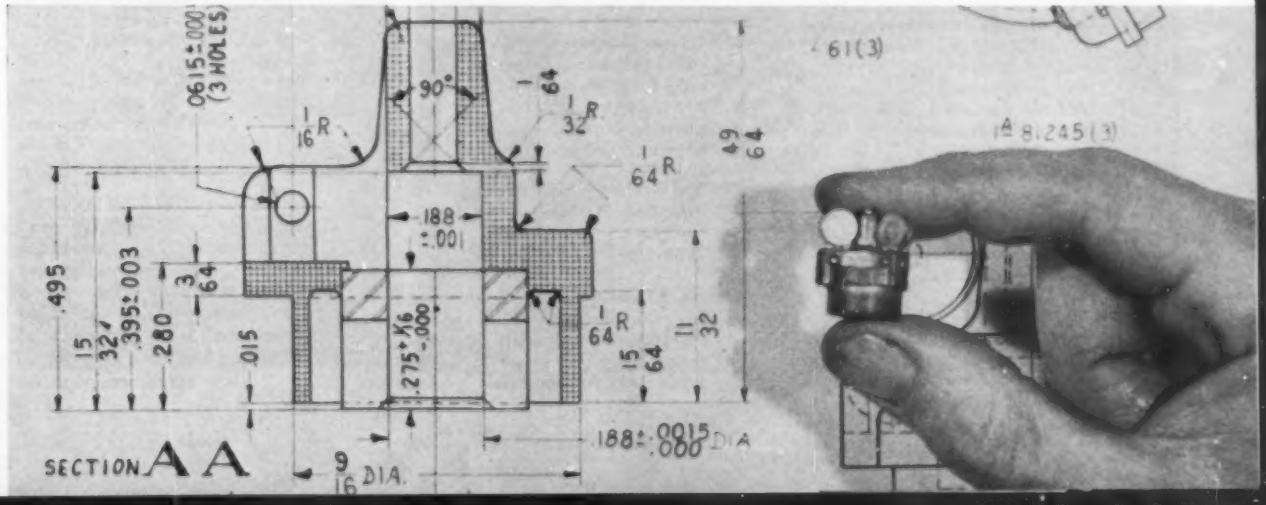
DOUBLE-PART GATE is compared to the finished governor held above it. Examination of the unfinished parts shows excellent detail of the castings.

CASTING PRODUCTION STEPS

1. Place inserts in two-cavity die
2. Close die
3. Inject molten zinc into cavity
4. Remove gate
5. File off flash
6. Burr slots
7. Drill, ream, and burr small holes

CLOSE TOLERANCES possible when die casting in zinc can be seen in the cross-sectional drawing of the motor-governor held at right. Reason why zinc was specified for the part is that it is possible to hold closer tolerances, in general, when casting parts in this metal.

Photos courtesy of The American Zinc Institute



DATA OFFERED IN THIS MONTH'S ADS

the Reader Service Cards on the facing page will get you these free reference materials. Circle the numbers and mail.

1. **Die Casting Machines**—Bulletin P-10 from ABC Die Casting Machine Co., provides complete engineering data and prices on the company's line of small die casting machines.

2. **Refax Pots**—Information is available on the company's line of Refax Pots, Ingot Molds, Utility Castings and Goosenecks. ACF Industries Inc.

6. **Die Casting Machines**—Catalog from American Die Casting Machinery Co., shows their complete line of die casting machines for zinc, tin and lead.

11. **Steel Plunger Rings**—Technical information describes hardened steel plunger rings, for die casting machines, that are giving over 100,000 shots per set. Auto-Diesel Piston Ring Co.

12. **Die Casting Machines**—A complete catalog is available from B & T Machinery on their line of cold chamber and gooseneck type die casting machines which are designed and built to customer specifications.

13. **Die Casting Machine**—for small parts diecasting, features a 60 ton lock and has a 1 lb. capacity. Information on this machine, that requires no operator and reaches production averages up to 1500 shots per hour, is available from DCMT Sales Corp., Div. of British Industries Corp.

14. **Sintered Powder**—products; their composition, manufacture and application, are discussed in a 24-page engineering handbook from Bunting Brass and Bronze Co.

15. **Corrosion Resistance**—far above normal melting temperatures, possible because of Refrax silicon-nitride-bonded silicon carbide, is discussed in literature from the Refractories Div., Carborundum Co.

16. **Automatic Loader**—unloader; that loads laminations, die casts, trims, and unloads 4 rotors automatically, is presented in an illustrated brochure from Cast-Master, Inc.

17. **Fire-Resistant**—Celanese Cellulubes are described in a new technical bulletin from Celanese Corp. of America. No pressure surges, no evidence of fire and excellent lubrication, are the three main features.

20. **Die Casting Machines**—Bulletin 5246 from The Cleveland Automatic Machinery Co. gives specifications of 50, 200, 400, and 600-ton machines for zinc and aluminum die casting.

21. **Vacuum Plating**—Bulletins from Consolidated Electrodynamics, Rochester Div., tell how this process lowers material and labor costs, and eliminates buffing and polishing.

22. **Special Castings**—The facilities, of the Crucible Steel Co. of America, Special Cast Products Div., for producing specialized tool steel castings by the investment and other processes is presented in an informative booklet.

24. **Die Cavity Sets**—A 12-page brochure from the Detroit Mold Engineering Co. gives complete prices and specifications on six new standard sizes of cavity sets for die casting.

25. **Universal Testers**—for tensile, transverse, compression and shear, are described in bulletins from W. C. Dillon & Co., Inc.

27. **Shell Molding**—Technical information on shell resins, and the booklet "59 Answers to Your Shell Molding Problems", are available from General Electric Co., Chemical Materials Dept.

30. **Technical Information**—on tiny die cast parts is available in literature from Gries Reproducer Corp.

31. **Briquetting Presses**—Design and engineering data sheets are available from Haller, Inc., on their hydraulic and mechanical briquetting presses; built for speed, accuracy and economy.

32. **Die Casting**—"Die Casting With Zinc Base Alloys," is the title of the new revised guide from Henning Bros. & Smith.

33. **Investment Casting**—A brochure from Hitchiner Mfg. Co. shows how investment casting answers design problems in shape, detail production and material.

34. **Sinterings**—A new 12-page brochure from Hoeganaes Sponge Iron Corp., provides an excellent introduction to powder metallurgy in metal parts production.

36. **Die Casting Machines**—Bulletin 5400J from Hydraulic Press Mfg. Co., presents information on how their machines provide quality castings, better density control, uniform finishes and less scrap.

38. **Electric Furnaces**—Technical information is available on rocking electric furnaces, from Detroit Electric Furnace Div., Kuhlman Electric Co., that will melt small quantities of any ferrous or nonferrous alloy.

40. **Die Casting Machines**—Bulletin 101 from Lester-Phoenix, Inc., gives specifications and complete descriptions for the company's line of die casting machines.

45. **Standard Bearings**—National Molded Products, Inc. has issued a listing of standard size bushings and bearings carried in stock. Sizes, load data, etc. are furnished.

46. **Plast-Iron Powders**—Technical data on 10 standard compacting grades of iron powders is available from the Plastic Metals Div., National U.S. Radiator Corp.

49. **Brass Powder Parts**—Detailed information on the design properties, production, and application of brass and other non-ferrous powder parts is available from The New Jersey Zinc Co.

50. **Vacuum Furnaces**—The latest copy of the progress report to the metals industry describing Kinney Vacuum Furnaces is available from Kinney Mfg. Div., New York Air Brake Co.

54. **Vacuum Die Casting**—Full information on the advantages of the "Vacucast" process for zinc die castings is available from Reed-Prentice Corp.

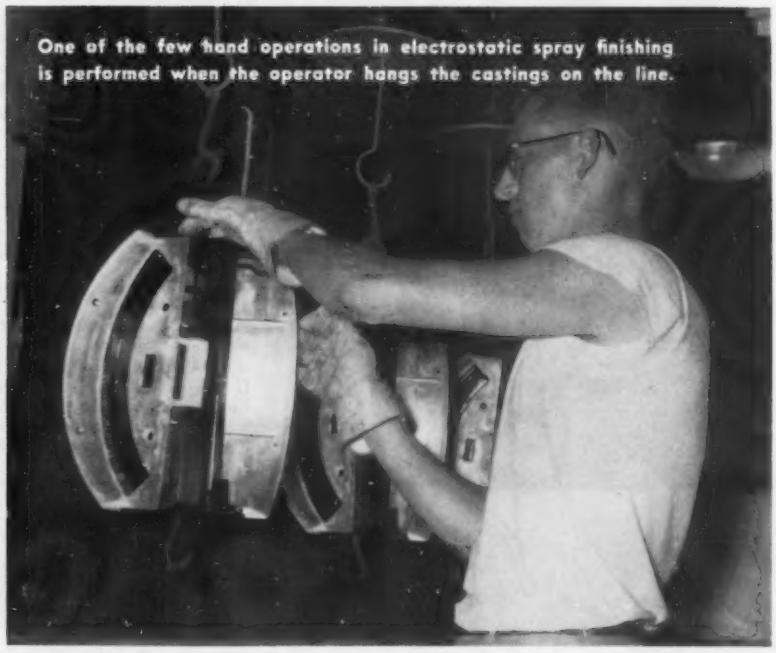
55. **Iron Powders**—Booklet Adv-763, from Republic Steel Corp., contains information on test evaluations, chemical composition, and physical properties for their line of powders with the controlled dimensional factor process of manufacturing.

Continued on page 84

PMM

Finishing Section

The specialized finishing methods, equipment and materials used to machine, assemble, surface condition or surface coat precision metal molded parts are presented here. This includes all secondary operations which convert a raw casting to a finished product.



One of the few hand operations in electrostatic spray finishing is performed when the operator hangs the castings on the line.

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DIE CASTINGS

Here's How this Company Found It Was Able to . . .

Cut the Number of Finishing Rejects in Half

BY WILLIAM D. JONES*

CUTTING paint costs by an impressive 50% was not the only benefit received from our installation of the electro-static paint-spray line. For example, there was an 80% increase in the number of parts that it is possible to finish for each uncut gallon of paint used. We arrived at this figure by comparing the old production rates based on handspray, to the new production rates with the electro-static spray.

And then there is floor space needed for the finishing operation. The old hand operated spray-booth line would need 1500 square feet of space if it had been expanded to such a degree as to be able to turn out the work now done with the atomizers. Present floor space needed for our finishing line is a mere 800 square feet, almost a 50% reduction.

Then there is the added advantage of general cleanup and maintenance. Since the installation of the electro-static spray line, this job is 80% less strenuous. There is little or no overspray, thus practically no buildup on hooks and conveyor. These parts, completely manufactured at the King-Seeley plant, are zinc die castings. Their alloy is Aluminum No. 3, a metal which casts to close tolerances and needs little or no machine-finishing. Only the flash is removed. Two holes are drilled and counter-sunk in each casting.

As they are scheduled for painting, each is hung on a conveyor. They are cleaned and made ready for the spray operation by being put through a detergent bath, a hot rinse, and a cold rinse.

The conveyor line moves into the spray booth occupied by the atomizer and its fine film of charged paint droplets. Since the conveyor is grounded, the paint particles are drawn to its load of castings when they enter the electro-static field. The paint, as it is delivered from the atomizer's head, becomes charged with the same polarity as the head itself. This is opposite to the polarity of the part being painted. In the influence of the field, the paint particles are attracted to the surface of the casting and deposited there.

This great attraction of the particles to their position on the casting is responsible for the more effective use of materials in the electro-static spray method when compared to hand-spray.

The paint is delivered through a polyethylene hose from a tank to the atomizer. This is accomplished with a positive displacement type pump. The atomizing head rotates in order to distribute the paint uniformly to its periphery for spraying.

The charge in the atomizing head comes from a high static potential fed from the high voltage power supply. The conductor carrying the charge is insulated with a polyethylene coating. Controls provide push button operation and a protective spark-guard unit for the operation.

The entire list of equipment used in the finishing line includes an integral motor rotator and disc, a pump unit, a hose to meter the paint to the disc, the power supply which charges the disc to a high electric potential, the protective spark-guard apparatus, and controls and switches.

Also needed to make the line complete is a conveyor, baking ovens, an exhaust system, work-holders, and other equipment.

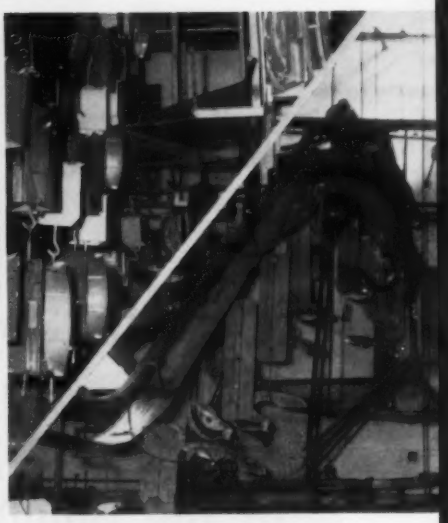
After painting, the parts move into the oven where they are baked for a period of 20 minutes at a temperature of 270° F. As soon as they are cooled, and still on the conveyor, the decorative sections of the castings are hand-sprayed. The electro-statically sprayed areas are masked with precisely designed contour masks before the parts receive their hand-sprayed coating.

ELECTRO-STATIC spray equipment: left, is atomizer; right, control panel.

*Operations Analyst, The King-Seeley Corp., Ann Arbor, Michigan.

READY for spraying, castings are being hung on conveyor for . . .

SPRAYING electro-statically to spread paint evenly so that it is . . .



BAKED at 270° F. Parts enter oven at left, leave at right.

Next and last step is a return to the oven where they are baked again for 20 minutes at a temperature of 270° F.

The conveyor carries its load of castings through the finishing line at a speed of six and one-half feet per minute. The workholders are stationed 16 inches apart. Each workholder carries two castings. Thicknesses of the films deposited on the castings are one mil for the prime coat and more than one mil for the finish coat.

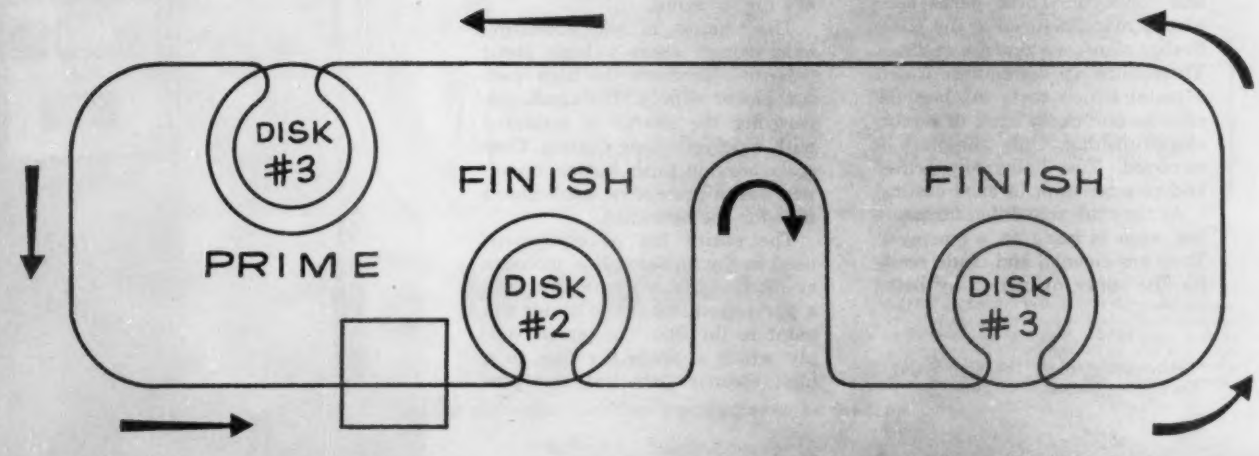
The paint shield which nearly surrounds the parts as they are being sprayed, stands seven feet high. An exception is the front section of the shield which is cut away at a point 48 inches above the floor to allow the conveyor to pass in and out freely with its load of castings. Little, if any, paint passes out through the opening however, as the charged particles are drawn only toward the nearest grounded object, in this case, the castings on the conveyor.

Because of the way the line is designed, it is *insured* that these nearest objects shall be the castings, since all components at high voltage have 18 inches or more clearance from *all* grounded objects *except* the castings being sprayed.

The atomizing head and its disc are specifically tilted at a standard angle. This means they are set at 23 degrees. The center of the unit stands at a pre-set height of five feet above the base which has a diameter of 24 inches.

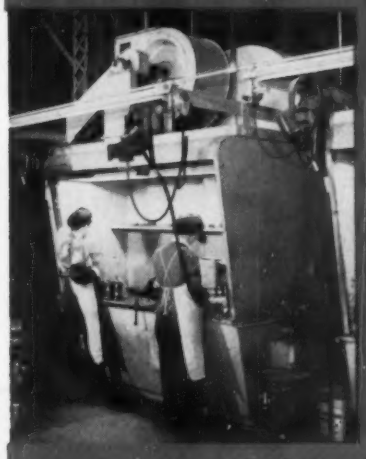
The advantages of using the electro-static spray to finish die castings have become more and more apparent to us at King-Seeley. The space occupied is compact and efficiently used as compared to the hand-sprayed line in the water washed booths we once had. We have been able to cut costs, time, and waste with this installation.

SPRAY FINISHING LINE at King-Seeley is seen in this schematic layout. Three atomizers eject the electrically charged paint droplets in sequence. The first applies primer, the others give castings a finishing coat. Baking is the next step in the process.



Proved Superior

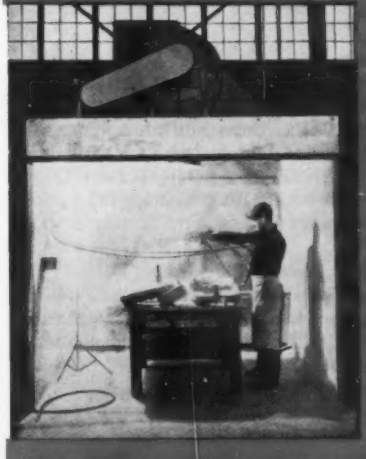
for the safe collection of dust, fine chips and fumes when processing and finishing non-ferrous metals such as MAGNESIUM



PETERS-DALTON *Hydro-Whirl* WET TYPE DUST COLLECTORS

For the proper and safest method of collecting highly inflammable dusts, fine chips and grindings, the Wet Method is BEST. Peters-Dalton Hydro-Whirl Wet Type Dust Collectors are efficient in operation . . . low in price . . . and provide maximum safety to plant and personnel, particularly during what can be hazardous operations, such as grinding, polishing and buffing magnesium alloys.

Illustrated here are four types of PD Wet Type installations. *Upper left*—well ventilated bench for the safe collection of dust produced from portable tool and flexible shaft grinding, polishing and buffing; *upper right* — dust collector for grinding stands and polishing jacks; *lower left* — water-wash type spray booth for removing noxious fumes created while spraying oxidation inhibitors containing fluorides or other toxic compounds on cores; *lower right* — high velocity side hood wet collector for dust, fumes and smoke during a foundry "shakeout" operation.



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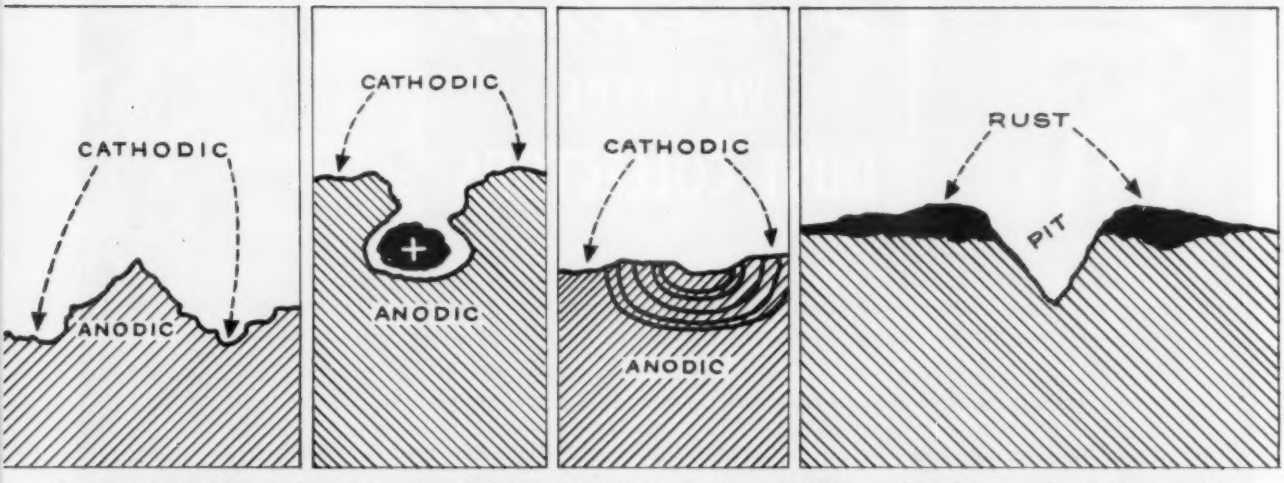
For more information circle No. 73 on the Reader Service Card

Here Are Advantages of Conversion

The inorganic films produced on metallic surfaces by chemical



CAUSES of electrochemical corrosion on steel. Surface irregularities on an apparently smooth surface often combine when moist to form minute electrolytic cells. At far left is seen cell formed by *peak*, center cell was formed by *occlusion*, and that at right resulted from *stress*.

RUST results when the electric flow carries iron away from anodic areas and piles the iron oxide on the cathodic areas. Sometimes metallic soaps are formed, weakening paint.

A WIDE variety of conversion coatings are used but the two most common are phosphate and chromate types.

Little is known of the chemistry of either of these two. In the case of chromate coatings, it is assumed that a complex oxidation-reduction occurs. This results in the formation of a gelatinous film, soft and absorptive while wet, but which hardens upon drying.

It is believed that the films contain a mixture of trivalent and hexavalent chromium complexes. The yellow films have a high content of these compounds while olive drab films are mostly trivalent chromium complexes.

The thin, clear chromate films are probably chromium oxide plus water of hydration.

The films are an integral part of the base metal being processed. They vary in physical characteristics, appearance, and cost, depending on the processing methods and materials selected.

Phosphate coatings are created when steel comes in contact with a zinc phosphatizing solution. In general the following theoretical reactions show the formation of the zinc phosphate film on a steel surface.

(1) $2H_3PO_4 + Fe \rightarrow Fe(H_2PO_4)_2 + H_2$

(2) $Fe(H_2PO_4)_2 + H_2O \rightleftarrows FeHPO_4 + H_3PO_4$

(3) $H_2 + 0$ (oxidizing agent) $\rightarrow H_2O$

(4) $3Zn\ (H_2PO_4)_2 + H_2O \rightarrow Zn_3(PO_4)_2 + 4H_3PO_4$

These four reactions can be summarized to show the formation of an iron-zinc phosphate:

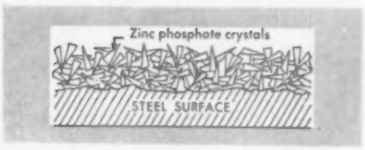
(5) $3Zn\ (H_2PO_4)_2 + Fe + O \rightarrow FeHPO_4 + Zn_3\ (PO_4)_2 + 3H_3PO_4 + H_2O$

Since these reactions are of a general nature, they do not tell the entire story but they should be sufficient for a practical understanding of the zinc phosphatizing mechanism in action.

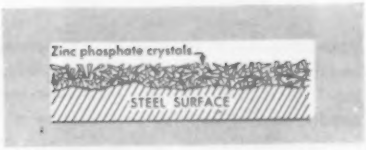
In contrast to amorphous chromate films, phosphate films are crystalline. When deposited from a normal phosphatizing solution, the crystal structure is coarse. Finer grained desposits can be secured by using activators, usu-

Coatings

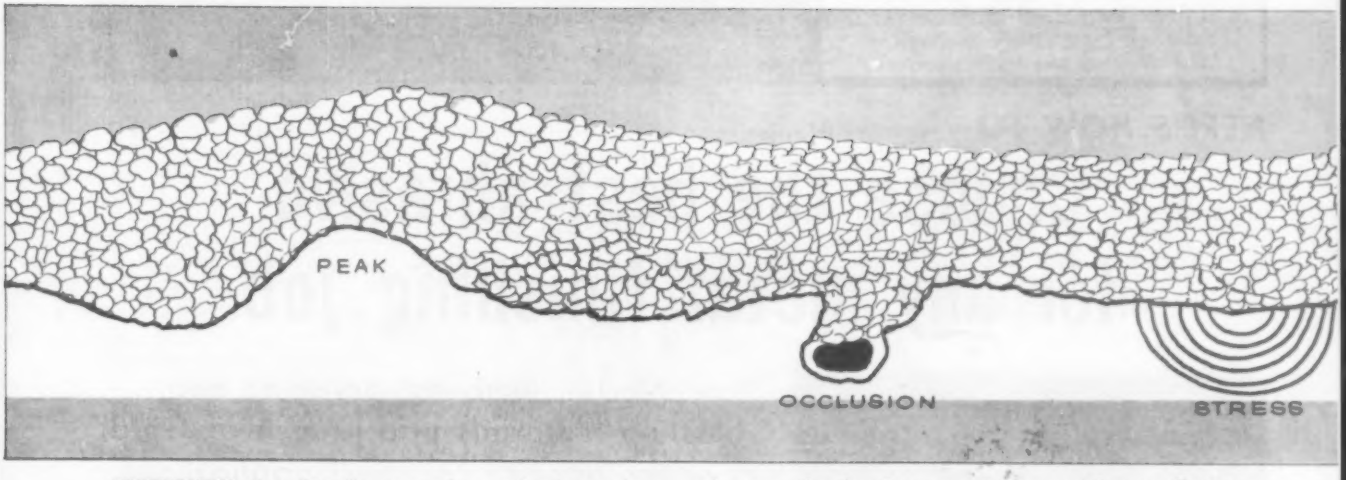
reactions.



LARGE crystals on non-activated surface look like those seen here.



SMALL crystals on an activated surface are dense and close together.



PROTECTION of steel by the conversion coating is seen in the diagram above. The electrically inert coating of phosphate crystals overcomes the effect of the anodic-cathodic differences seen in the other diagrams. Together with this advantage, the phosphate crystals have an inherent affinity for paint and thus help to lock it to the steel base. This is the ultimate goal of a conversion coating. The film becomes, in fact, a part of the metallic base itself.

ally titanium compounds which are added to the phosphate bath.

While the chromate conversion coatings may be used as the final coat instead of pre-treatment for some other finish, phosphate coatings are used as bases for organic finishes.

A significant difference between the types is the self-healing characteristic of the chromate film. If treated parts are damaged, the ruptured chromate film will spread across the opening. Phosphate coatings will not heal in this manner.

The corrosion protection given by both is similar. Test figures quoted for a zinc part with a phosphate coating, and a good organic finish, show less than 1/32″ corrosion creepage.

This was after 300 hours in a standard A.S.T.M. salt spray treatment. A heavy chromate film applied scientifically for corrosion protection without subsequent organic finish, will resist between 200 and 300 hours of a standard salt spray before showing any signs of corrosion. In a 100% humidity cabinet at a temperature of 100° F, both types show only pinpoint blistering after 1000 hours.

There is also a difference in hardness. Phosphates are very hard but chromates are soft, particularly under high humidity conditions. Both differ in their acceptance of dyes.

Phosphate coatings cannot be successfully colored, whereas chromate films can. They produce yellow, olive drab, or clear coatings and any of these can be dyed. To date, only black dyes have shown any permanance. Other colors fade rapidly.

An advantage of phosphate coatings is their ability to work on ferrous and non-ferrous parts. This allows inter-mixing of parts on the finishing line. When this is done, phosphate baths will handle such mixtures without alteration.

Chromate conversion coatings cannot be applied to bare steel unless the parts are zinc or cadmium plated first. The use of phosphate coatings is usually restricted to iron, steel, and zinc.

Copper base metals cannot be given a phosphate coating but can

Continued on page 57

Four Different TUMBLEX* Abrasives assure best possible results in barrel finishing. TUMBLEX "A", most popular for general needs, removes flash, scale, burrs and tool marks, while forming radii and finishes to required microinches. TUMBLEX "T" is bonded, triangular and fast-cutting for special intricate parts, and won't wedge in work slots or holes. TUMBLEX "S", exceptionally dense and long lasting, is bonded spheres that get into areas where other shapes won't reach. "A", "T" and "S" are all made of famous ALUNDUM* (aluminum oxide) abrasive. TUMBLEX "N" is natural stones, exclusively Norton, of rounded shapes that bring up high lustre, especially on die castings and soft metals.

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For more information circle No. 71 on the Reader Service Card

CONVERSION COATINGS

continued from page 55

be treated by specific chromate preparations as directed.

Application of both types is a simple operation.

The parts must be cleaned and passed through the chromating or phosphatizing solution. Adequate rinsing and drying follow.

All of the chromates require immersion. Certain phosphatizing materials may be sprayed on. Most of the phosphate treatments require fixing after the crystalline surface has been formed in a chromate-phosphate dip or spray.

All chemical conversion coating processes can be adapted to automatic finishing line operations where the volume of work is great enough. In many installations where the metal parts are to be painted, the phosphating or chromating line is put between the cleaner and paint spray to allow an overhead conveyor to service all three finishing sections as needed.

When it is necessary to assemble parts by spot or resistance welding before surface finishing, a chromate conversion coating can be applied before welding.

This is possible because the low electrical resistance of the coating makes sound welds without any difficulty.

The editors express their thanks to these companies who furnished basic information for this article:

Allied Research Products Co.
Pennsylvania Salt Mfg. Co.
E. F. Houghton & Co.
The Mitchell-Bradford Chemical Co.
The Chemical Corp.
Metasurf Corp.
Conversion Chemical Corp.
Frederick Gumm Chemical Co., Inc.
Turco Products, Inc.
Neilson Chemical Co.
Parker Rust Proof Co.
Enthone, Inc.
Oakite Products, Inc.

WAGNER BUYS AUTOMATIC MOLDING MACHINE CO.

Wagner Brothers Inc., Detroit, producers of chemical supplies and automatic plating machines, has purchased outright the Automatic Molding Machine Co. of Los Angeles, Calif., including patent rights to the firm's automatic compression and injection molding presses for plastics, J. R. Wagner, president, reported recently.

According to Wagner, the West coast plant will continue to operate at its present site. However, he says, the recently developed press, built in sizes from 10 to 100-ton capacities, will be marketed on a nation-wide scale.

KINDER JOINS MACDERMID RESEARCH LAB STAFF

David H. Kinder has been named Research & Developmeent Chemist by MacDermid Incorporated, Waterbury, Connecticut manufacturer of metal cleaning, plating and finishing chemicals. He will work in MacDermid's laboratory on a new line cf chromate conversion coatings.

For six years prior to joining MacDermid, he worked as a Development Engineer for Allied Research Products, Baltimore, Maryland, on the development of new chromates. He has been a Control Chemist for Pemco Corporation, Baltimore, manufacturers of frits and pigments used in porcelain enameling.

David H. Kinder

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USEFUL LITERATURE, CATALOGS, MANUALS

any of these technical publications may be obtained by circling the appropriate numbers on the Reader Service Cards, Pages 48-49

PROCESSES

Casting Processes: 154

Buckeye Brass & Mfg. Co., B-Mold Div.—Of interest to the design engineer and production executive is this comparative description of the qualities and advantages of Investment, Permanent Mold and Centrifugal castings. Illustrated, the literature shows the importance of selecting the right casting method in terms of design, application, suitability and cost.

Sinterings: 185

Fansteel Metallurgical Corp.—A special Metal Show bulletin discusses the latest developments in the refractory metals — molybdenum, tungsten and columbium. Illustrations show the wide variety of sizes and shapes which can be produced with these metals.

MATERIALS & EQUIPMENT

Shell Mold Emulsion: 155

Union Carbide Corp., Silicones Div.—Data sheet SF-1077 describes a new and improved emulsion which gives excellent release of patterns with a low film build-up. The LE-460 Silicone Parting Emulsion, is a stock emulsion of dimethyl silicone oil, in a concentration of 35% by weight.

Anodizing Racks: 156

Service Screw Products Co.—Anodizing racks of aluminum or titanium but otherwise identical are described in a new illustrated brochure. The workholders can be quickly assembled or revised to anodize a virtually unlimited variety of parts.

Cast-Metals Chart: 157

Alloy Precision Castings Co.—A new 11" x 17" two-color chart, based on the company's experience in producing both frozen mercury and lost wax investment castings, tabulates the composition and physical properties of alloys commonly used for investment castings. Two sets of mechanical properties are delineated. The first is for metal in the annealed state; the second is for hardened castings.

Pattern & Tablet Letters: 158

Canton Products. — A new catalog on pattern and tablet letters as well as foundry trademarks and monograms is available. The complete range of sizes and styles is illustrated.

Geared Flexible Couplings: 159

Link-Belt Company.—Book No. 2775, "Geared Flexible Couplings", presents application and selection data for couplings with maximum bores ranging up to seven inches and ratings from 2½ to 572 horsepower per 100 r.p.m.

Die-Profiler: 160

Engis Equipment Co.—Illustrated literature describes a new Di-Profiler; a precision reciprocating hand machine for die, tool and mold making, precision fitting and tool maintenance. Price list No. 0754, for the tools and accessories, is also available.

Color Code & Calibration Chart: 161

Thermo Electric Co., Inc.—This handy two-color chart shows the color codes and calibration symbols for thermocouples and thermocouple extension wires. The reverse side of the chart gives resistance tables for pyrometer wires in ohms per 100 ft. at 68°F.

Foundry Equipment: 162

Industrial Equipment Co., 72-page catalog.—Catalog No. 58 features molten metal handling equipment for all metals. Included are numerous photos and dimension sheets.

Hard-Facing Alloys: 163

Haynes Stellite Company, A Div. of UCC.—A new 8-page booklet describes the chemical composition, properties, application and application procedures for 11 Haynes alloys that are available as bare rods, crushed particles and powder.

Anode Bag: 164

Hanson-Van Winkle-Munning Co.—Literature is available on a new anode bag that is designed for easy fastening. Ease of handling, long life, and lab inspected cloth are the three main features of the bag.

Vacuum Die Casting Machines: 186

Kux Machine Co.—A new illustrated brochure describes the Kux vac-u-die system of pressure die casting. This method provides venting of the die by vacuum before metal injection takes place.

FINISHING

Inserts: 174

Groov-Pin Corp.—Literature describes a new Tap-Lok Insert which was designed to meet the requirements of the aircraft industry. The H-Series works on the self-tapping principle, and are installed into drilled or cored holes with a special driver.

Spray-Mask Painting Machine: 175

Sepanski & Associates.—Bulletin PMM-6 presents detailed information on a new automatic spray mask painting machine. Model BS-6M is quickly adaptable to simple or difficult spray-mask painting problems involving work pieces of various sizes, shapes and surface conditions.

Blast Cleaning Machines: 176

Wheelabrator Corp., 34-page brochure.—"Special Cleaning Problems Solved", is the title of this illustrated brochure which shows how airless blast cleaning, air blast cleaning and wet blast cleaning has been employed in specific applications.

Copper Plating Process: 177

Metal & Thermit Corp.—M & T Bright Cyanide Copper is a new copper plating process featuring a combination of additives which reduce plating costs and simplify control. Literature furnishes technical data on this process which is applicable to automatic, still and barrel plating.

Heat Treating: 178

Leeds & Northrup Co., 20-page catalog.—The effect of steam atmosphere heat treating on powdered iron, brasses & bronzes, aluminum and beryllium copper is presented in this illustrated brochure.

Barrel Finishing: 179

Almco Div., Queen Stove Works, Inc., 52-page handbook.—How it is possible to deburr and finish large parts, such as compressor housings, is one of the many topics discussed in this Barrel Finishing Handbook.

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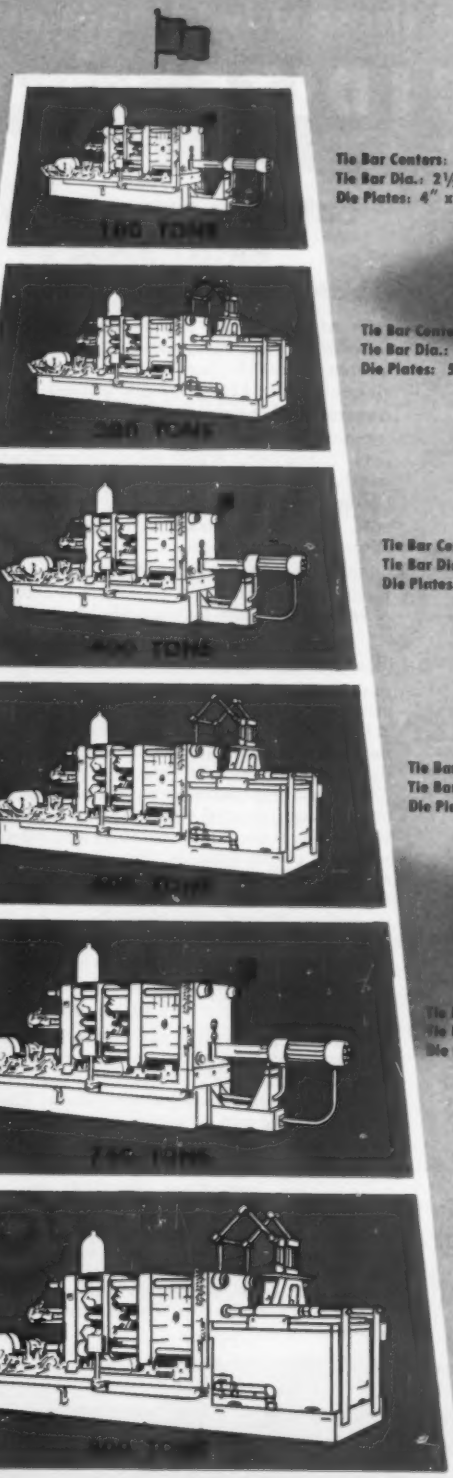

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Die Plates: 7" x 46" x 44"

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Tie Bar Dia.: 6"
Die Plates: 9" x 48" x 48"

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Tie Bar Dia.: 6½"
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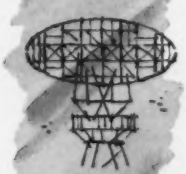

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PUBLISHER RECEIVES HEART SOCIETY AWARD

L. to R.: Allen, Hexter

One of three 1957 Gold Heart awards of the American Heart Association for outstanding contributions to both cardiovascular medicine and the Heart Association program, was presented in Chicago recently to Irving B. Hexter of Cleveland, Ohio. The awards were given by Dr. Edgar V. Allen of Rochester, Minn.

Hexter is president of the Industrial Publishing Co. and Vice President of the American Heart Association.

BRUSH BERYLLIUM NAMES NEW VICE PRESIDENT

Bengt R. F. Kjellgren, President of The Brush Beryllium Company, announced the appointment of George S. Mikhalapov as Executive Vice President of the beryllium producing company.

George S. Mikhalapov

Mr. Mikhalapov, a graduate of The Massachusetts Institute of Technology, was formerly President of Coast Metals, Incorporated of Little Ferry, New Jersey.

HEADS ANACONDA SALES

The appointment of E. F. Murphy, Jr. to the position of assistant sales manager of Anaconda Sales Company is announced today. Mr. Murphy will be in charge of aluminum sales, according to T. A. Campbell, president.

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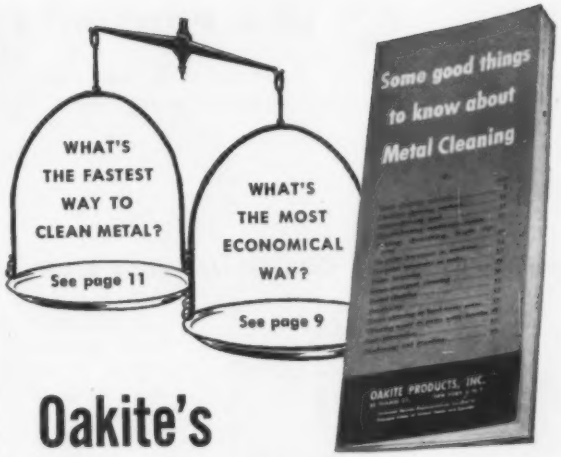
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See page 11
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See page 9
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NEW PRODUCTS AND DEVELOPMENTS

Want complete details on these announcements? Use the Reader Service Cards. You'll find them facing page 48 of this issue

30-INCH VACUUM COATER HAS BEEN REDESIGNED

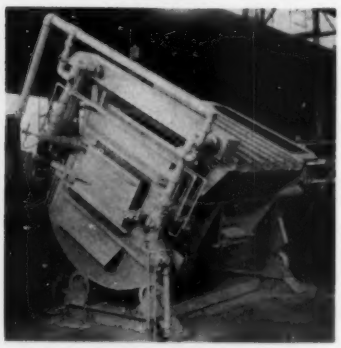
A 30-inch vacuum coater has been redesigned for economical plating of materials with vaporized metals. The LC1-30, developed by the Rochester Div., of Consolidated Electrodynamics Corp., was designed primarily for the small or medium-sized finisher. It has a production rate of five to seven cycles an hour. With the unit it is possible to metallize 400-600 pieces, 1½ inches in diameter, per cycle. The work chamber is a 30- by 45- inch horizontal steel tank with a hinged door at one end.

A 14-inch oil-diffusion pump, a 110 cfm roughing pump, and a 3.5-cfm holding pump comprise the pumping system.

The unit is complete with roughing, backing, and air-inlet valves and a water-cooled high-vacuum valve which minimizes back-streaming pump-oil vapor. The unit is 9′ high, 6′ wide, 13′ deep and weighs 4190 lbs.

Circle No. 205 on Reader Service Card

NEW FURNACE SERIES IS TILTING REVERBERATORY TYPE



An excellent means for providing aluminum continuously from a centralized source to holding furnaces is offered in the new "SWB" furnace series from Stroman Furnace & Engineering Co.

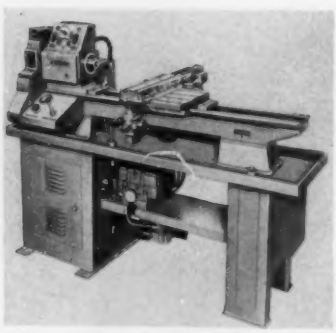
Of a tilting reverberatory type, gas or oil fired, the furnaces can easily be charged, fluxed, alloyed and cleaned. Maintenance and relining are made simple by the removable spring loaded bung-arches which form the entire roof.

The furnaces are presently manufactured in 1000, 1700, 2500 and 3000 lb. holding capacities with hourly melt rates that closely parallel the rated capacities.

Present installations report that the outstanding feature of the furnaces, for their size, is the ability to have hot metal available from a cold start in 1 to 1½ hours.

Circle No. 206 on Reader Service Card

TURNING AND BORING MACHINE PERFORMS SEVERAL OPERATIONS SIMULTANEOUSLY



A semi-automatic turning and boring machine that assures maximum economies by performing several machining operations simultaneously, or in continuous sequence, is being manufactured by Clausing Div., Atlas Press Co. With the unit it is possible to do turning, boring, facing, forming, grooving, chamfering, beveling and cutting-off, to close tolerance.

Model 6405, illustrated, features a hydraulically operated cross slide mounted on a hydraulically operated longitudinal table. Four cycles are available by merely turning the dial selector on the control panel.

The use of simple block tool holders, carbide insert bits and standard boring bars provide for easy and inexpensive set-ups. The machine is completely automatic except for loading and unloading operations.

Outstanding features include: Table and cross slide may be set to feed at selected speed for full traverse, to advance at rapid traverse, to work and feed to positive stop, or to skip feed; bed ways are flame hardened; enclosed headstock; pumped oil bath; 2 HP, 2-speed, continuous duty, constant HP spindle drive motor.

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HYDROLUBES

PROTECTION The fire-resistance of CARBIDE's fire-resistant hydraulic fluids has been proved by severe, exhaustive laboratory tests. And, in actual service, water-base UCON hydrolubes have prevented serious fires and injuries during more than 10 years of routine use in all types of industrial hydraulic equipment. The common fire hazards connected with hydraulic operations are eliminated when UCON hydrolubes are used. UCON hydrolubes are classified as acceptable, less hazardous fluids by Factory Mutual Laboratories.

ECONOMY UCON hydrolubes 150-CP and 275-CP are the economical answer to fire-resistance in hydraulic fluids. Most commercial hydraulic equipment can be easily converted to UCON hydrolubes with a minimum of time and expense. UCON hydrolubes have no harmful effects on most packings or seals. In fact, in many instances, reduced leakage losses have been reported. UCON hydrolubes also provide maximum protection against liquid and vapor phase corrosion and have outstanding anti-wear characteristics—thus, pump replacement costs are also held to a minimum.

Why not get all the facts on how UCON hydrolubes can mean protection plus economy for you. Write today for the booklet, "UCON Hydrolubes Spell Safety," F-40134.

UNION CARBIDE CHEMICALS COMPANY

Division of UNION CARBIDE Corporation

30 East 42nd Street, New York 17, N. Y.

"Ucon" is a registered trade-mark of UCC.

For more information circle No. 60 on the Reader Service Card

ABRASIVE WHEEL . . . features narrow strips

A new abrasive wheel has been designed that produces a highly resiliant brushing action. The thousands of narrow finger-like abrasive strips give the wheel more exact control in working complex contours and curvatures. Manufactured by Merit Products Inc., the wheel is especially useful in polishing, deburring and removal of surface flaws on all metals.

Sizes include diameters of 14" and 16"; widths from 3" to 60".

Circle No. 210 on Reader Service Card

DUST COLLECTOR . . . has 9 cu. ft. capacity

The Dustkop is designed especially for use in shop operations of the chip producing variety, but is suited to any other operation with a large dust volume. This roll-away dust bin, developed by Aget Mfg. Co., has a nine cubic foot capacity, 1/3 hp motor and a cast aluminum fan capable of handling sizable metal fragments without plugging.

The unit is also available as a recirculating collector using a cloth filter bag.

Circle No. 211 on Reader Service Card

DUSTLESS BLAST MATERIAL . . . is free of silica

A new blasting material, Black Beauty Blast Grit, is being recommended as the safest, cleanest material for castings and nonferrous metals. Being practically dustless, and silica-free, the material reduces the health hazard to workers. Sharp cutting edges leave clean surfaces with no deposits that might ruin the bonding action of a surface covering.

Manufactured by H. B. Reed & Co., the material will not rust, pack, clog or foul machines and is completely inert.

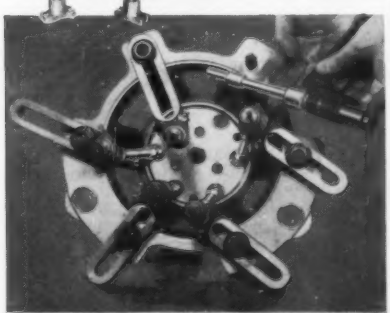
Circle No. 219 on Reader Service Card

Drill or Tap OVER A MILLION different hole combinations on any drill press!

NEW Ettco-Emrick

Universal Ball Joint Adjustable Spindle MULTIPLE DRILLING AND TAPPING HEADS

Featuring Ettco's Exclusive Lubricated Ball Joints with Neoprene Covers



Underview of model 600 head. Design of spindle and locating arm assures rapid accurate setting of spindles—even while unit is running.

Here's why these versatile smooth-running heads give you the dependable high-production accuracy needed in small hole drilling and tapping:

Wide range of spindle settings
Add or remove spindles fast
Tap or drill capacities to 5/16" in steel
1:1 ratio of drive to driven spindle
No reversing motor needed
Light weight and compact
Long trouble-free service
100% guaranteed

Write for details today or see your nearest Ettco distributor

The only full-line manufacturer of drilling and tapping equipment for the entire small hole field

ETTCO TOOL & MACHINE CO., INC.
586 Johnson Avenue, Brooklyn 37, N.Y.
Chicago • Detroit • Los Angeles
Indianapolis • Hartford • Houston
TAPPING ATTACHMENTS • MULTIPLE HEADS • STANDARD AND SPECIAL DRILLING & TAPPING UNITS AND MACHINES • INDEXING FIXTURES

Circle No. 67 on the Reader Service Card

POSITIVE LOCATION . . . of work piece in spray mask is possible

A new development makes possible the positive location and perfect fit of product pieces into spray masks. Made of plastic and formed to the part, the new nesting pads eliminate the possible fracturing of finished surfaces, such as chrome, a common occurance with metal pads with leveling screw bolts. The pads are a development of Conforming Matrix Corp.

Circle No. 217 on Reader Service Card

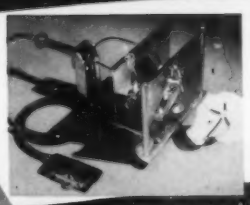
PLATE POTS . . . for high temp. salt baths

Custom-made "plate pots" have been developed for salt bath heat-treating applications when neutral or cyanide salts are used. The pots are made to withstand temperatures of 1500° to 2100°F.

Manufactured by Wiretex Mfg. Co., the pots are fabricated in any plate thickness with ¼" considered as standard. Features are dished bottom heads; overlapping seams and flat steel flanges around the tops; and doubled welds inside and out.

Circle No. 218 on Reader Service Card

GET AHEAD in Your SPRAY DECORATING with Conforming Matrix



Mechanical and Air Operated Clamps and Pressure Fixtures for Holding Masks and Parts

Standard and special fixtures speed up production—assure highest quality work. Horizontal: Adjustable to masks 3" to 36". Vertical: Revolve 360°. Square shaft registering air piston pioneered by Conforming. Ejectors prevent distorted parts or parts from different cavities from sticking in mask. Double Acting: Apply pressure to both sides of parts to be painted on two or more sides with one masking. Send for free literature.

Conforming Matrix CORPORATION
346 Toledo Factories Building
Toledo 2, Ohio

Circle No. 66 on the Reader Service Card

Now- A FULL LINE OF Luster-on® POWDERS FOR CHROMATE TREATING

ZINC

#50: Bright, clear, lustrous, nickel-like, corrosion-resistant; requires leach.
#51: Similar to #50, but bluish chrome-like color.
#52: Low-cost, no leach, bright, passive.

CADMIUM

#50: See under Zinc, above.
#53: Improved solubility, control, safety in handling; requires leach.

COPPER & BRASS

Cobra: Bright, yellowish, decorative and/or protective film, non-fuming, single dip.

ALUMINUM

222M Sealer: Clear or colored film for corrosion protection and paint bond.

MAGNESIUM

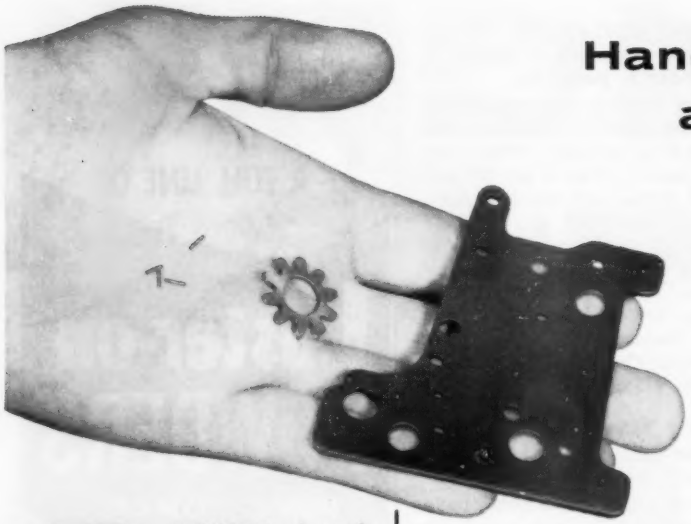
MPD 60: Yellowish film for corrosion protection and paint base.

Data Sheets and Prices on Request. Send in part for free processing.

West Coast: Crown Chem. & Engr. Los Angeles & San Francisco
Canadian Licensee: Alloycraft Ltd. Montreal

THE Chemical CORPORATION
66 WALTHAM AVE., SPRINGFIELD, MASS.

Circle No. 65 on the Reader Service Card



Hand Your Deburring and Finishing Problems to ALMCO...

These companies did... and cut costs, improved quality, increased production.

DEBURRING of spark plug bushings by hand formerly caused many rejects at Canadian Pratt and Whitney. Costs were $104.20 per M with rejects totalling 12½%. Two Almco barrel finishing machines cut costs 97%, practically eliminated rejects.

SMALL GREASE GUN COUPLER JAWS (½" x ⅜") couldn't be deburred manually at a midwest screw products firm. With an Almco barrel finishing machine, 40,000 coupler jaws can now be deburred in 10 hours. Jaws are smooth, uniform, ready for plating.

DEBURRING AND POLISHING by manual methods proved expensive for delicate instrument and fountain pen parts at J. Bishop & Co. Almco barrel finishing machine increased output from 200 to 6000 parts per hour, cut costs 98.8%. Annual savings: $6,917.50.

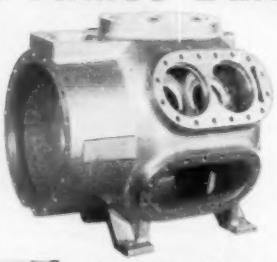
INCREASED PRODUCTION quotas demanded faster finishing at Alco Valve Co. Hand deburring and polishing finished only 200 stainless steel parts per hour. Almco machines are now barrel finishing over 1400 per hour, and to stricter finishing specs. Plant production needs are easily filled.

FILING burrs by hand formerly cost $55 per 100 needle plate forgings at Landis Machine Co. Now an Almco barrel finishing machine has cut finishing costs to 55 cents per 100 parts. Parts are uniform, rejects are eliminated. Savings come to 99%!

HEAVY WORK LOADS of roller bearings presented serious finishing problems at Timken's Columbus, Ohio plant. Now special heavy-duty Almco barrel finishing machines are processing two tons of rollers per load. And 50% of floor space has been saved, finishing costs have been slashed.

Large Parts too are Almco Barrel Finished!

AT AN IOWA FOUNDRY, an Almco barrel finishing machine deburrs, polishes 48 large wash machine agitators per hour. Fixtures hold castings firmly within Almco barrel. Rough edges are completely removed; castings are highly polished; appearance is improved.



AT AIR CONDITIONING FIRM, compressor housings weighing over 100 lbs. are Almco barrel finished. Almco process breaks sharp edges of castings, cleans internal surfaces, and improves surface finishes. Two housings are cleaned in 20 minute cycle! Workmen are relieved for other plant tasks!

Send Your Parts to Almco's Modern Test Laboratory.

Sample parts processed without obligation. Simply write on letterhead, sending parts direct to Albert Lea, enclosing specifications required. Complete, *free* report includes recommendation. 52 PAGE HANDBOOK ON BARREL FINISHING SENT ON REQUEST.

ALMCO

DIVISION OF QUEEN STOVE WORKS, INC.

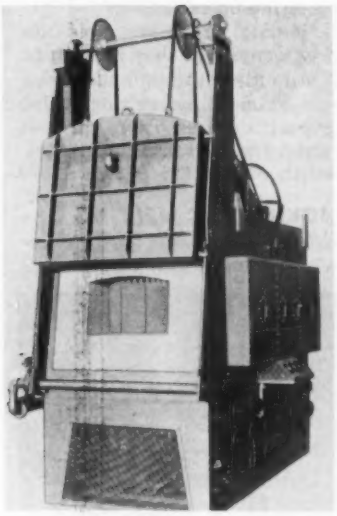
712 Marshall Street • Albert Lea, Minnesota

Sales and Engineering Offices in Chicago, Detroit, Los Angeles, Newark, New Haven and Philadelphia.

IN ENGLAND: Almco Division of Great Britain, Ltd., Bury Mead Works, Hitchin, Herts, England.

For more information circle No. 64 on the Reader Service Card

ELECTRIC FURNACES
. . . have silicon-carbide heating elements



This new line of furnaces is designed for operation to 3000° F flash heats in oxidizing or neutral atmospheres, 2850° F continuous operation in oxidizing or neutral atmospheres, and 2500° F continuously in reducing atmospheres.

These units, designed by L & L Mfg. Co., are suitable for laboratory and production use in the firing of cermets, sinterings and other high temperature work in either oxidizing, reducing or neutral atmospheres.

The unit illustrated has a firing chamber 18″ wide x 160″ long. The insulating brick can operate at 3200 F.

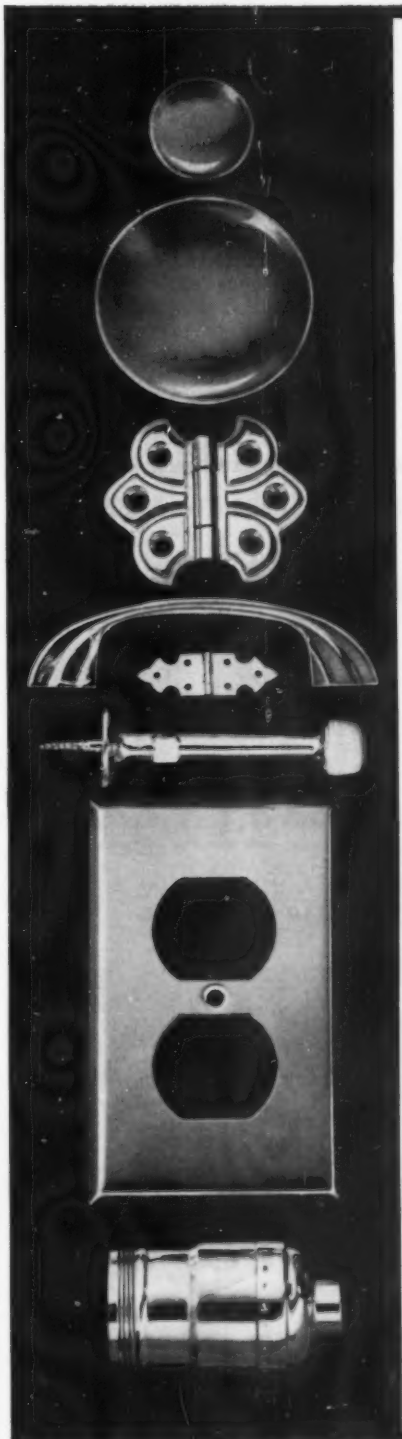
Circle No. 226 on Reader Service Card

ULTRASONIC CLEANER
. . . is self contained

A new self-contained cleaning unit was introduced at the National Metal Exposition & Congress last month by Branson Ultrasonic Corp. The cleaner includes a heater, temperature control, filtration and recirculation system in addition to the ultrasonic generating equipment.

Overall dimensions are 22″ x 19″ x 37″ high. The size of the tank is 6″ x 6″ x 11″ deep, with a total working volume of 5 gallons. The transducers mounted to the bottom have a rated input of 250 r-f watt average (1 kw peak), which they convert into mechanical vibrations at 38 kc. This high-speed agitation causes cavitation in the liquid, providing a gentle but thorough scrubbing action.

Circle No. 216 on Reader Service Card



Why profits are bigger *when you plate with vacuum*

An investment in a CEC vacuum coater brings big returns three ways:

1. Lower labor costs. Operating a CEC vacuum coater takes no special skills. Labor costs per piece are far lower than in traditional methods because the process is *fast*.

2. Eliminate buffing and polishing. A CEC vacuum coater lays down a surface that's bright without polishing. No further handwork is needed—just an easily applied protective lacquer.

3. Lower material costs. Ten cents worth of aluminum will vacuum-plate thousands of parts such as those shown here. Lacquers are relatively inexpensive, too.

Added durability

The *decorative* values of vacuum-plated finishes are well known. Now they can be remarkably durable, too. New coatings—recently developed epoxy lacquers, synthetic resins—can preserve those gleaming finishes indefinitely against abrasion, humidity, and other hazards.

To learn more about this new, and highly profitable process, write us for bulletins.

Consolidated Electrodynamics
Rochester Division, Rochester 3, N.Y.
formerly Consolidated Vacuum

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES

For more information circle No. 21 on the Reader Service Card

MICRO PROJECTOR
. . . features verticle principle of design

The Scherr Micro Projector features a vertical design principle which offers the following advantages: A horizontal stage onto which flat work is laid without aid of fixtures or holding devices; An inclined screen on which the enlarged image is reproduced directly in front of the observer; A choice of standard magnifications; Both measuring motions, when using the micrometer cross slide, are performed on the same plane, namely the horizontal and most natural one.

Manufactured by the George Scherr Co., Inc. the unit is low priced. Accessories include a Micrometer cross slide stage, with 2" by 2" range, and a rotary protractor ring reading to 5 minutes of arc by means of vernier.

Circle No. 208 on Reader Service Card

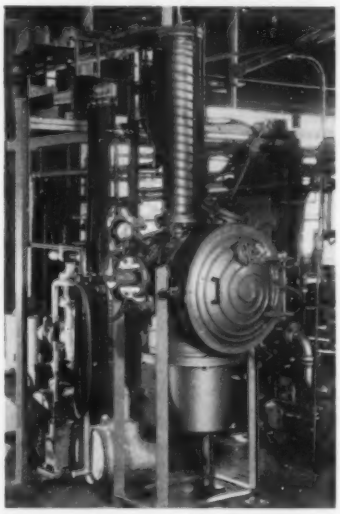
MAGNETS CARRY PARTS
. . . on overhead conveyors

Magne-Carrier is the name of a new system which completely eliminates clamps, hooks and other positioning and attaching methods. The system, developed by Multifinish Mfg. Co., employs magnetic principles for conveying parts through the various processing operations.

Life-time magnets hold the parts securely as they move from place to place through such processes as cleaning, rinsing, painting and drying. There are 16 standard models available.

Circle No. 209 on Reader Service Card

VACUUM ARC MELTING FURNACE
. . . for laboratory use



The Model 2703 vacuum arc skull melting furnace was developed to fill the need for a versatile arc unit which could be used for laboratory work in alloy and process development. The furnace is capable of melting reactive metals as well as ferrous and non-ferrous metals.

Developed by the NRC Equipment Corporation, the furnace is capable of pouring 8 pounds of titanium, or 14 pounds of steel, and is equipped with vacuum pumping systems, DC arc power supply and control panel.

Circle No. 222 on Reader Service Card

HOPPER PANS
. . . speed handling of barrel-finishing media

Three hopper pans to speed loading, unloading, storage and transfer of barrel-finishing media have been developed by Rampe Mfg. Co. The welded steel pans have ball-bearing wheels and a balanced yoke for easy transport and lifting.

Standard sizes include a one cu. ft. hand-size pan, and 4 cu. ft., and 8 cu. ft. sizes for handling with crane or hoist hook.

Circle No. 221 on Reader Service Card

SHORT RUN DIE CASTINGS IN ZINC PRODUCED THROUGH

MODERN *Craftsmanship* from Phoenix

We, at Phoenix, are not Swiss watch-makers, but we do pride ourselves on producing some of the most intricate, close tolerance zinc die castings made today for some of the most respected names in American industry. Coupling modern production facilities and techniques with a good measure of care and "pride in a job well done" has enabled us to build an enviable reputation as a prime supplier for short run, precision work. And the really tough jobs, with many extra operations, don't faze us a bit . . . as a matter of fact, we thrive on them! In addition, should you encounter a zinc die casting problem, our engineering department stands ready to give you the kind of able assistance you need to solve it. Next time you need the finest in zinc die castings . . . think of Phoenix!

PHOENIX DIE CASTING CO.
21 ILLINOIS STREET BUFFALO, NEW YORK

For more information circle No. 51 on the Reader Service Card

VACUUM SINTERING

Continued from page 46

Fig. 4 shows the effect of compacting pressure on the density of pressed and subsequently sintered zirconium and zirconium hydride powder compacts, both sintered in high vacuum. This graph indicates that for powders compacted at 60 tsi, full density can be reached by simultaneous decomposition of zirconium hydride and sintering for 3 hours at 1260° C, whereas metallic zirconium powder compacts do not densify completely even when sintered for the same period of time at 1320° C. We may call this type of sintering of zirconium hydride compacts "activated sintering", i.e., sintering at an increased rate due to the additional reactions taking place during bonding.

What has been said here for zirconium is just an example, and the same phenomena can be observed also when working with titanium, thorium or uranium.

In conclusion, it can be said that the atmosphere in which sintering takes place is a factor of utmost importance which determines the structure and properties of the sintered material.

Actually vacuum sintering is already widely applied, and the application of vacuum in powder metallurgy is steadily growing.

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HAMMOND MODEL VRRO
Two-Spindle Variable Speed Lathe

STEP UP PRODUCTION — REDUCE FINISHING COSTS with Hammond DOUBLE SPINDLE LATHES

- No "down time" for one operator when the other changes wheel — each operator has his own motor, control and variable speed drive.
- Convenient Variable Speed dial is within arm's reach of the operator — no "climbing" around in back to change speeds.
- Wheel economy and better finish. As wheel wears each operator can increase speed — to maintain constant peripheral speed for uniform and better finish, maximum production and wheel life.
- Available in 3 sizes — two 5 HP, two 7½ HP or two 10 HP.

ALSO AVAILABLE IN WIDE SWING MODEL VRROW

Wide swing construction, with extended bearing housings and spindles, provides additional working space for large, bulky pieces.

Cost reduction is the need of the day — Write for catalog.

Hammond OF KALAMAZOO "Good Machinery Since '82"

Hammond Machinery Builders Inc.

1642 DOUGLAS AVE. — KALAMAZOO, MICHIGAN

For more information circle No. 68 on the Reader Service Card

NEW PRODUCTS—

continued from page 68

PRODUCTION DISSOLVERS
. . . have increased power

Two new large size production dissolvers, with increased mixing power and flexibility, have been introduced by Cowles Dissolver Co. Model 510VHV is a variable speed mixer that will handle a variety of mixing and dispersing jobs at speeds from 900 to 2100 rpm. It has a hydraulic lift for 42" maximum rise and the bridge may be swung in a 180° arc.

Model 720VH is the largest-capacity lift-type mixer yet developed. This unit makes possible the application of 20 to 40 H. P. 1800 rpm motors for handling big volume and high viscosity batches. Hydraulic lift allows 48" maximum rise. Bridge swings in 150 degree arc.

Circle No. 212 on Reader Service Card

LOCKNUT
. . . has nylon insert

A new line of nylon insert locknuts, with a die-cast zinc alloy hex nut body and a molded nylon compression collar for its locking element, has been introduced by Gries Reproducer Corp. A special manufacturing method prevents the collar from turning or breaking out. The nylon locking element maintains a constant grip on the screw threads, dampens vibration, seals out moisture, and resists loosening. The die-cast nut body is rustproof and corrosion resistant. The nuts will be available in a range of thread sizes from #4 to ½".

Circle No. 213 on Reader Service Card

NEW INSERT
. . . is driven with a hex bar

"Inserto U-Tap" is the name of a internally and externally threaded steel insert that locks itself into the parent material at specified torque levels when driven.

The main feature of this insert, manufactured by Rosan Inc., is the method of installation. The internal threads are hexagonally thru-broached the entire length of the insert to accommodate a hex-drive bar. The hex-bar is the only implement needed to drive the insert and it can be used in any hand or power tool.

Circle No. 214 on Reader Service Card

TRANSFER UNIT
. . . is for any transfer problem

A new fully automatic transfer unit, can readly be adapted to practically any mechanized materials handling transfer problem. The unit, developed by Wagner Bros., Inc., can be adapted to transfer parts from conveyor hook to machine, from belt to machine, and from machine to machine.

The unit is designed so that it can be operated either hydraulically or electrically. Hydraulic power is used for short carriage strokes, and electric for the longer strokes. All mechanism of the unit, which operates on a track, is confined within the transfer carriage to make a completely self-contained unit.

Circle No. 228 on Reader Service Card

HIGH VACUUM VALVE
. . . is six inches high

The new high vacuum valve features a choice of flange dimensions and minimum space between flange faces. It is possible to select flanging compatible with other components without requiring special adaptors or extra fittings.

The valve, developed by Vacuum Research Co., is a quick act-

CASTING PROBLEMS?

You'll find even more of the answers in this NEW REVISED edition of

HENNING'S

helpful guide

Here are all of the factors, influencing the production of good castings (alloy composition, temperatures, metal injection pressures, gating, venting, etc.) AS WELL AS common faults or defects . . . what causes them . . . how they may be avoided. Those who had a copy of the first edition know what a valuable aid it can be for plant managers, die casting machine operators and others in industries using zinc base alloys.

Authoritative . . . informative . . . it is available in quantities without charge. It is one of the "extra" services provided by Henning Bros. & Smith to help you get better casting results . . . just as the "extra" steps in Henning's start-to-finish quality control assures you of the purity and uniformity of HB&S alloys.

"Dependable service since 1922"

Write for your copies of the new revised edition #877A TODAY. For alloys that meet your exact casting needs, turn to:

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Smelters and Refiners of Aluminum, Bronze, Brass, Zinc, Lead

For more information circle No. 32 on the Reader Service Card

ing type, with an unobstructed straight-through opening. Scuffing and wear is eliminated since there is no valve-disc contact until the valve is closed. The closing action is a ball-and-socket principle. Other features are a positively sealed O-ring stuffing box with no drag-through, light weight aluminum alloy construction, and proved performance to pressures lower than 10^{-6}mm Hg.

The new 6″ thin design is an addition to a range of smaller valves which have been in wide use for several years.

Circle No. 220 on Reader Service Card

4 NEW PRODUCTS . . . *featured at metal exposition*

The Magnaflux Corp. unveiled four new products at the National Metal Exposition:

The Magnaglo Type ARV-304 Unit, features built in stainless steel tanks that permit the use of water-suspendible fluorescent Magnaglo. A conveyorized inspection station speeds testing and provides for automatic demagnetization.

Bondchek - heat repelled fluid aids in finding the lack of bond in metallic honeycomb materials.

The ZA-43 Portable Zyglo kit, which contains all materials necessary for maximum sensitivity fluorescent testing, can be used for overhaul tests, especially of non-magnetic parts, etc.

Two new fluorescent magnetic powders, No. 14 oil suspendible and No. 20 water suspendible, contain improved fluorescent and magnetic properties for greater sensitivity.

Circle No. 229 on Reader Service Card

CLEANING MACHINE . . . *for small parts*

A new machine has been developed especially for washing tote boxes and small metal parts of various shapes and dimensions. Manufactured by Magnus Chemical Co., Inc., the machine combines power spray washing and dip-immersion-agitation assuring cleaned tote boxes and basketed parts.

Small parts are loaded in baskets and then washed and rinsed, using vertical agitation, at the rate of 25 baskets per hour. Tote boxes are washed in the power spray washing section of the machine. As a basket of clean metal parts returns to the loading stage, a clean tote box is ready for loading of the cleaned parts for delivery to the next operation.

Circle No. 225 on Reader Service Card.

ALUMINUM
Alloy
DIE CASTINGS
by
STROH!

STROH'S experience in producing zinc alloy die castings since 1903 is now being applied to making ALUMINUM DIE CASTINGS of the same outstanding Quality. We can give you precisely *what* you want *when* you want it and will welcome your inquiry.

STROH DIE CASTING Co. INC.
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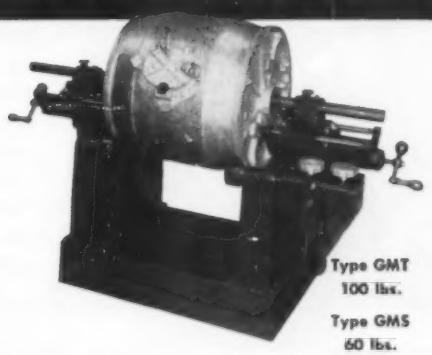
For Research and Small Production

Detroit
GM Series
ROCKING
Electric
Furnaces



Type GMT
100 lbs.

Type GMS
60 lbs.

With these Detroit Rocking Electric Furnaces, you can melt small quantities of any ferrous or non-ferrous alloy to the required analysis quickly, economically. Indirect arc melting provides accurate heat control plus minimum carbon pickup. Automatic rocking action assures homogeneous alloying, full heat utilization and longer lining life. Electrodes are independently mounted for easy shell interchange. Types GMS and GMT Furnaces are sold complete with transformers, ready for installation. Write today for full information.

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HERE'S HOW...

INVESTMENT CASTING ANSWERS DESIGN PROBLEMS

Investment Casting is a specific production method that fills a specific function. This process offers much greater latitude in shape, detail reproduction and choice of alloy than any other process.

IN SHAPE

The picture tells the story . . . from the cross section it can be seen that the inside dimensions are greater than the holes. How else but by Investment Casting could this be made in one piece?

IN DETAIL REPRODUCTION

One look quickly shows the machining problems — most of them stock removal. By using an Investment Casting 21 out of 45 machining operations were eliminated.

IN MATERIAL

These nozzles for a highway striping paint sprayer, were produced from cold rolled steel until ground glass was introduced into the paint for its reflective properties. To provide necessary wear resistance these parts are now cast in a non-machinable alloy. Performance was not sacrificed because of material limitations.

For more information ask for our brochure . . . its FREE of course.

These are a few examples demonstrating that the function of the part is the first consideration in design — and — the Investment Casting process was the economical answer.

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For more information circle No. 33 on the Reader Service Card

NEW TYPE WING NUTS . . . are capped and washer base

Two new types of wing nuts, made of die-cast zinc alloy, have been introduced by Gries Reproducer Corp. Like a regular cap nut, the winged cap nut provides easy adjustment and offers a decorative means of finishing off bolt ends.

The one-piece washer base wing nut replaces a regular wing nut and flat washer. Handling and assembly time are reduced and inventory is cut in half. Both types of fasteners are available in a variety of thread sizes and wing spreads.

Circle No. 223 on Reader Service Card

NEW RELEASE AGENT . . . for shell molds

Shel-Cote, a new type parting agent, eliminates sticking, break-in, build-up and cleaning of shell mold patterns. Developed by Chem-Cote Co., the agent can be sprayed or brushed on hot patterns. The material bonds itself to the metal due to surface energies and a magnetic action leaving a thin impervious film that defies sticking. Resins will not wet or unite with its dry surface, providing a more constant dimensional accuracy. Once applied, the agent will not build on itself. This prevention of build-up eliminates the need for nut-shell blasting, high temperature burn-off or caustic cleaning.

Circle No. 227 on Reader Service Card

INSTANT WATER-GRAPHITE DIE LUBRICANT . . . for permanent molds

Graphite Suspension No. 74 is a newly developed water-graphite die lubricant for application to permanent molds and extrusion dies. The lubricant, manufactured by Joseph Dixon Crucible Co., is practically "instant" in that the addition of water to the concentrate immediately produces a uniform, high-quality lubricant, ready for use.

20:1 mixture of water and the compound is recommended on both solid and bridge-type dies. When applied to hot dies, the mixture produces a smooth, strongly-adhering coating, which protects die surfaces and provides superior extrusion finishes.

Two basic coatings are recommended for permanent molds, one a chill coating and the other a refractory coating.

Circle No. 224 on Reader Service Card

CLEANING MACHINE

. . . combines vertical and rotary agitation

A cleaning machine has been announced that combines washing and rinsing operations. Each stage, of the two stage machine is equipped with a special rotating and vertical agitating parts carrier complete with cylinder head hold-down device. The combined revolving and up and down motion produced in the cleaning solution scrubs all interior and exterior surfaces.

The machine, manufactured by the Equipment Div. of the Magnus Chemical Co., Inc., is designed for optional agitation of the work below the liquid with a 3″ to 5″ stroke, at approximately 160 up and down motions per minute; or a 6″ to 10″ stroke at 60 up and down motions per minute; or a 25″ to 30″ stroke which raises and lowers the platform on each stroke.

Circle No. 215 on Reader Service Card

GARZA TO HEAD STOKES INTERNATIONAL

Louis R. Garza has been appointed manager of the International Division of F. J. Stokes Corporation, Philadelphia, according to an announcement by A. A. Hutchings, Stokes' vice-president in charge of sales.

Mr. Garza was formerly ex-

Louis R. Garza

port manager of the Henry Disston Division of H. K. Porter Co., Inc., also of Philadelphia.

Stokes makes a wide range of vacuum processing equipment for the chemical, petroleum, pharmaceutical, and metalworking industries, an extensive line of plastics molding equipment and compacting presses for making parts from powder metal and ceramics. Its equipment is used in almost every country in the world.

THE

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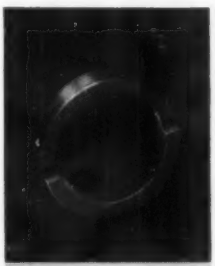

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1ST POWDER METALLURGY PARTS MANUFACTURERS' ASSOCIATION MEETING

Election of pro tem directors and officers to premanent status, and the acceptance into membership of two new companies, highlighted the first annual membership meeting of the Powder Metallurgy Parts Manufacturers Association.

This meeting took place in Pittsburgh on October 16 and 17. Smith Bolton, president, U. S. Graphite Co., as chairman of the nominating committee, suggested retaining the directors who had been serving since the founding of the Association last spring.

Membership present at first annual meeting.

This was adopted and the directors then reelected the pro tem officers. These officers are now serving one year terms: President, Kenneth M. Gleszer, executive vice president, Dixon Sintaloy, Inc.; first vice president, William R. Toeplitz, president Boundbrook Oil-Less Bearing Co.; secretary-treasurer, George L. Bachner, Powdered Metal Products Div., Yale & Towne Mfg. Co.

Elected to membership in the association were Eaton Mfg. Co., Powdered Metals Div., Coldwater, Michigan and Powder Metal Products, Inc., St. Marys, Pa.

There are now 21 member-companies in this new association. These firms are responsible for producing nearly all the structural and bearing parts formed of metal powders that are marketed in the United States.

The first membership meeting also featured a review of the current statistical program. Plans were adopted to increase membership. The gathering heard and discussed a report on current trends in industrial cost accounting procedures. Panel discussions reviewed powder-metallurgy parts use of and quality improvement; the assembly and distribution of industry statistics; and the promotion of standardization of powder-metallurgy parts including composition, physical properties of finished units, and testing methods.

SCOTT JOINS PENNSALT TECHNICAL DIVISION

The appointment of Dr. Francis Leslie Scott to the post of project leader in Pennsalt Chemicals Corporation's Technical Division has been announced by Dr. George McCoy, manager of Pennsalt Research and Development.

Dr. Scott will conduct basic research in organic nitrogen chemistry to develop for Pennsalt new and useful products derived from one of its basic chemicals, ammonia. A recognized authority in the field of nitrogen and sulfur chemistry, he is the author of more than 40 publications. He is a candidate for the D.Sc., the highest scientific award of the National University of Ireland.

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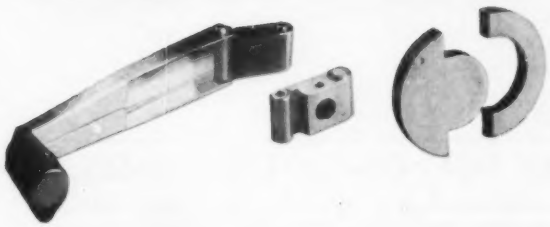
MEETING DESIGN NEEDS



The camera crank hinge, door knob and key for this REVERE 16mm Turret Model Motion Picture Camera are made of NICKEL SILVER powder—for important reasons.

Working with an experienced fabricator,* Revere engineers found that by designing specifically for powder metallurgy, THREE cost-saving advantages could be gained:

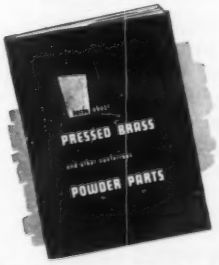
. . LOWER MATERIALS COSTS.
The nickel silver sinterings are less expensive than comparable parts produced from extruded stainless steel, the usual material used for similar parts.

. . LOWER PRODUCTION COSTS.
Metal powder sinterings eliminate expensive machining of holes and counterbore operations.

. . LOWER FINISHING AND ASSEMBLY COSTS.
Secondary operations are reduced to a simple drilling of a connecting hole for joining the knob and key and take advantage of the ease with which nickel silver may be given a light satin finish.

* Chicago Powdered Metal Products Company

How Can BRASS AND NICKEL SILVER POWDER PARTS Meet Your Design Needs?



For detailed information on the design, properties, production and application of brass and other nonferrous powder parts you should have a copy of our manual. It will give you 20 case histories of brass and nickel silver powder structural parts to assist in evaluating this means of production in terms of your particular needs.

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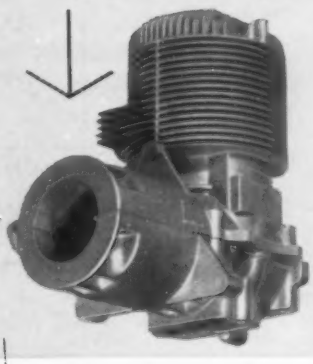

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PERMANENT MOLD CASTINGS

Efficient casting is done best with . . .

Proper Temperature Control Equipment

By NICHOLAS A. JANNETTO*

ALUMINUM in the molten state lends itself poorly to heat definition in the visible color range. Because of this, proper equipment is needed to control the temperatures which create progressive freezing of metal into useable castings.

Every casting has its own temperature-pouring range. Some aluminum alloys, because of their individual physical characteristics such as thin walls, for example, must be poured at higher temperatures than others.

Heat affects the various phases of making a casting.

Thermo-electric types of heat-control instruments are required for checking and re-checking temperatures of molten aluminum. The most common type used is a thermo-couple with suitable compensating leads and a millivoltmeter calibrated to permit a direct temperature reading by the operator.

Fourteen-gauge Chromel-Alumel wire thermo-couples, twisted at one end and welded together,

Continued on page 78

*Superintendent, Permanent Mold Foundry, The Monarch Aluminum Mfg. Co., Cleveland, Ohio.

EFFECT OF HEAT ON CASTING PHASES

GATING. Temperature must be controlled within allotted ranges when gating systems are established. If too low, misruns occur; when too high, shrinkage results.

CHARACTERISTICS. Temperature changes affect #214 alloy more than #43 alloy. This makes it possible to pour the #43 alloy in a mold made for #214, after slight changes. Pouring #214 in a mold made for #43 would only be possible after special gating changes.

FLUXING. Control of temperature makes certain that desired benefits will be obtained when fluxes are used.

IMPORTANT PARTS OF FUNCTIONING EQUIPMENT

TERMINAL HEAD—A porcelain fixture, it has electrical contact points having two holes and screws to tighten wires and make good electrical contact. Two screw-clamps attach the lead-wires.

COVER FOR THE HEAD—Made of cast aluminum or iron, the bottom is fitted for a ¾" pipe and the inside shaped to hold the head nested and immovable. When all electrical contacts are made, a cover is screwed on. Another threaded outlet at right angles to the thermo-couple's direction is used for the indicator's lead-wire.

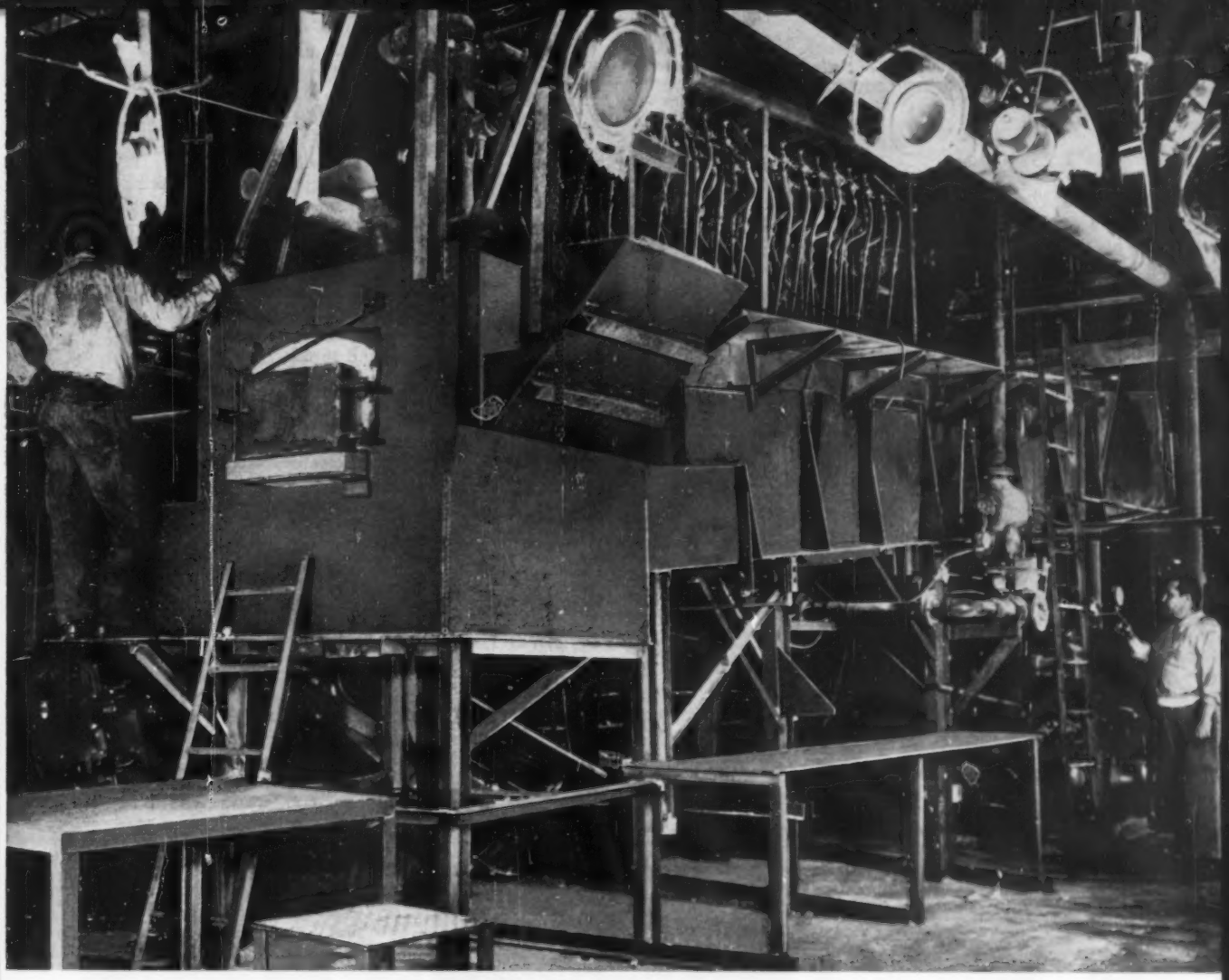
TUBE HOLDER—This is made up of a ¾" pipe going through a cross bar with clamps to fit under the tube-flange. It is threaded at one end, tapered to fit the tube at the other. Threaded end of the head is connected to the unattached cover. The thermo-couple wires with the ceramic indicators in place, are pushed through this holder and connected to the head in the cover-attachment.

The silicon-carbide tube is attached to the holder which holds it suspended in the metal so that no variation of temperature is shown. A depth of between five and nine inches gives good results.

Cast iron tubes can be used but must be coated with wash to resist being attacked by the aluminum. It was discovered that cast iron tubes held up fairly well at temperatures below 1300°F. At higher temperatures their life is short.

Average silicon-carbide tube life is about 20 working days. Cast iron lasts only two days. The greatest difficulty with the silicon-carbide tubes is that they must be handled carefully as a slight bump will break them.

EXTENSION WIRES—Unless the pair of extension wires which form the thermo-couple keep cold junctions away from the furnace, extensive temper-



CONTROL panel is seen at far right in the above photograph showing a melting furnace at Monarch Aluminum. Metal is kept flowing continuously from this furnace and heat control is a vital part of the process. Temperatures must be kept at a constant level to insure permanent mold castings of high quality.

FOR ACCURATE CONTROL

ature variations will result. When extension wires have the same thermo-electric characteristics, or are made of the same materials as the thermocouple, the cold junction will not be located at the furnace. Instead, it will be at the instrument's binding posts, a position of nearly constant temperature. By using the potentiometer every day, the cold junction will be compensated in millivoltmeter adjustment.

COLD JUNCTIONS—Every thermo-electric pyrometer is usually calibrated for a particular cold-junction temperature of 32°F or 75°F but need not be maintained there as long as the actual temperature is known, since it is possible to compensate for the difference between cold-junction temperature and that for which it is calibrated.

INDICATORS — A millivolt indicator or potentiometer is used for readings.

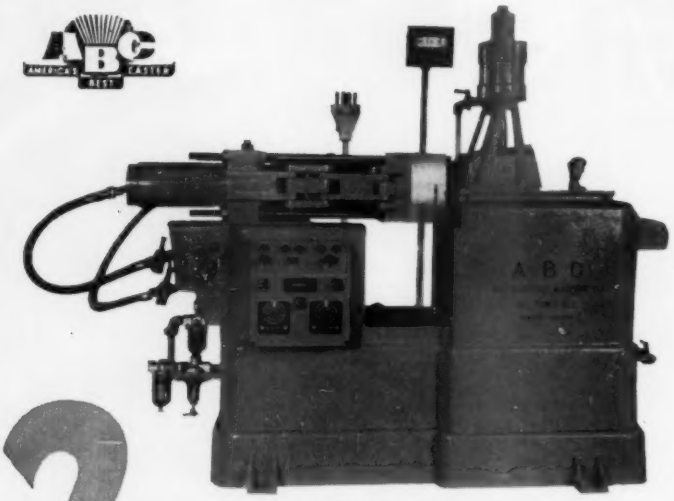
MILLIVOLT INDICATOR — This consists of a moving coil mounted with pivots to turn in jewel bearings between the pole pieces of a permanent magnet. It is contained by two spiral springs and turns through an angle proportional to the current passing through the coil.

THERMO-COUPLES — Chromel-Alumel combinations are most used in these instruments. Chromel is a nickel-chromium alloy which resists oxidation up to 2400°F. Alumel is a nickel-manganese-aluminum-silicon alloy.

The diameter of the wires is 14-gauge B. S. when used in a protection tube, or eight-gauge when used at the end of an open-end pyrometer. Wires are twisted two complete turns and welded together. Ceramic insulators separate them.

MOTOR-VALVE — A unit composed of a small motor designed for control use, it also includes a butterfly valve. This unit is placed in the line supplying air to furnace.

For more information circle No. 1 on the Reader Service Card



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TEMPERATURE

continued from page 77

are used at Monarch Aluminum. Wires are protected by a special silicon carbide tube which comes in different lengths and diameters and has a flange-collar at the open end. Sizes used have openings to fit a ¾" pipe attached to a fitting which is clamped around the flange. The other end of the pipe is connected to the thermo-couple head.

Portable and stationary equipment with several thermo-couples and a selector switch can be used for temperature checks but are not suitable for controls. Multiple recording units will record respective temperatures of determined stations, printing them in colored inks.

Selector switches may be turned to six different stations. The operator can relay temperatures but cannot control each furnace.

Potentiometer type pyrometers will balance themselves within two degrees at set intervals. But for normal foundry usage, the Capacitrol type controlling temperature within five degrees is satisfactory.

Checking pyrometers is important. Use a portable potentiometer balanced or corrected to the temperature near the pyrometer and having its own special thermo-couple.

Temperatures are read when thermo-couples are placed side-by-side. Any difference in the Capacitrol is adjusted to the potentiometer reading. During winter months we have found differences as great as 60°F. When this occurs too often, change the cold junction of the instrument.

Thermo-electric pyrometers are simple in construction, depending on the fact that heating two unlike metals in contact at a given point creates an electromotive force. This force flows around a circuit when the free ends of the metals are connected. Intensity of the force is proportional to temperature change. It can be measured by inserting a millivoltmeter in the circuit.

When specially balanced premixed fuel and air are used, a special fuel-regulator is not needed, since all that is necessary is a gas-tight butterfly-valve in the motor-valve unit.

The principle used is to balance the air, and gas or fuel pressure so that a ¼" impulse line placed downstream from the mo-

tor-valve and connected at the other end to the zero regulator, creates a change in air pressure which will activate the regulator to change the fuel-pressure.

When the motor-valve begins closing the air inlet, variations in impulse-line pressure carry the change to the regulator-diaphragm which moves to cut fuel.

When air pressure is greater than gas pressure coming in, an adjustment must be made. For this, a bleeder is used to bleed off excess when air goes through the impulse line at too-high a pressure.

When the control system works properly, after the thermo-couple has been lowered into the molten metal and the metal itself is up to temperature, controls will begin working in a matter of seconds. The light on the indicator will flicker out, the motor-valve unit will turn and the fire-intensity will go down. At the same time, one who is used to the sounds in a foundry will notice a blanket of silence as the furnace cuts out.

TITANIUM POWDER

continued from page 39

lyst on a large scale is inevitable.

Other uses being explored are "Titaniz.ng" of copper and copper alloys and as a specialized reducing agent in selected chemical processes. One important application is its use as a stabilizer in the form of zirconium oxide and thorium oxides in refractories.

These are but a few applications. With the cost of titanium stock as high as it is, and with the cost of labor going even higher it is only logical that use of titanium powder will increase for applications particularly adapted to powder metallurgy techniques.

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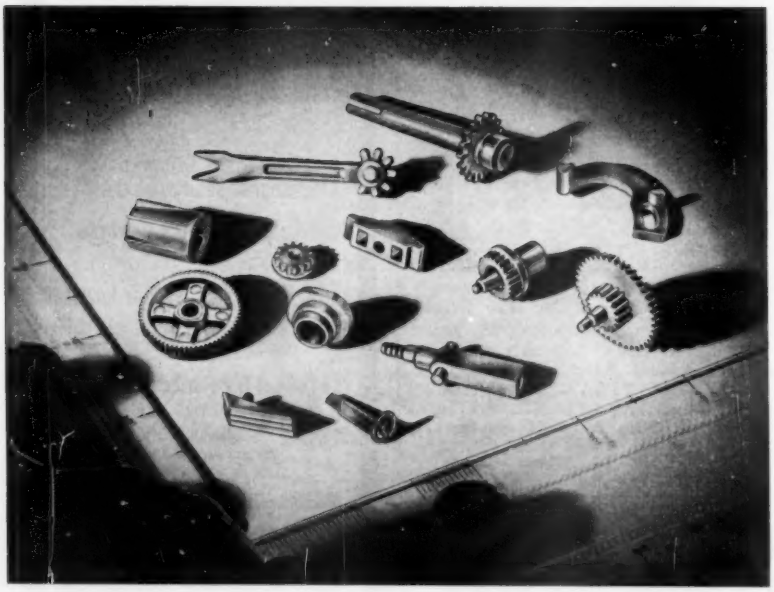
NEW GRC TINY DIE CAST PARTS EMPHASIZE BIG OPPORTUNITIES FOR IMPROVED DESIGN

NOW! Design change problems minimized because Gries' techniques are flexible, adaptable.



Design engineers find their work simplified by utilizing the unique die casting techniques developed by Gries Reproducer Corporation.

Gries manufactures simple or intricate zinc alloy parts in one high-speed, economical process. Problems such as additional manufacturing operations to produce slots, square holes, flats on round surfaces, etc. can usually be eliminated, GRC zinc alloy die cast parts are turned out completely trimmed, ready for use, in one automatic operation by Gries *exclusive* methods.

All this adds up to exceptional economy in the production of small parts, whether making changes in existing designs or planning new ones.

Gries' small parts are made to precise specifications. Maximum length 1¾ inches, maximum weight ½ ounce; smallness unlimited. All are mass-produced at low cost in quantities of 100,000 to many millions.

Send for Gries' fact-filled bulletin on tiny die castings today.

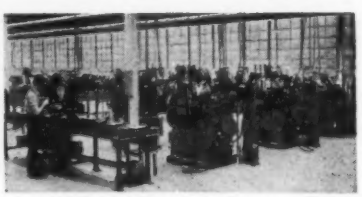
Gries Makes Extensive Line of Die Cast Zinc Alloy Threaded Fasteners

Gries produces by their exclusive die casting technique a line of high quality, low cost threaded fasteners, including wing nuts, cap nuts, wing screws, round-head thumb nuts, round-head thumb screws, rivets, which are available in a wide range of sizes. Quick delivery from stock. Specials to order. All are non-ferrous, rustproof, with clean threads and bright finish. GRC mass production techniques provide lower costs. A new bulletin is now available. Write for your copy of Gries Industrial Fastener Bulletin.

GRC "Intercast" Die Casting Offers Multiple-Parts Units with Movable Parts

In one automatic operation, Gries can "intercast" die cast tiny parts with removable elements, completely assembled, trimmed and ready to use. Elements fit precisely, yet move freely. Production of individual multiple-unit products or continuous "intercast" units is fast, economical and unique.

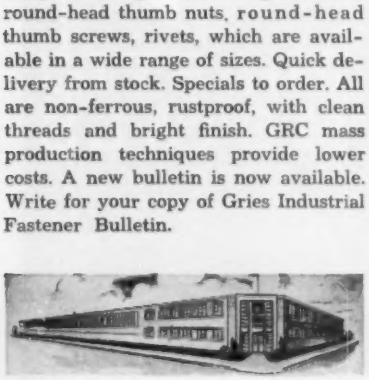
The "sister-hook" picture frame swivel rings, scissors, loose-leaf binder rings are 2-element movable "intercast" parts, whereas the chain shown in the photo is an example of continuous "intercasting". Send for samples and full information.



Exclusive Production Facilities Offered by Gries

At the modern Gries plant in Westchester County, New York, production facilities are geared to turn out quantities of 100,000 to many millions, completely trimmed and degated, ready for use. Smallness is unlimited: maximum weight ½ oz., maximum length, 1¾ in.

Gries also has full facilities for secondary operations such as tapping, drilling, assembling, reaming, special machining and surface finishing. Practically all commercial finishes can be applied to GRC zinc alloy die castings.



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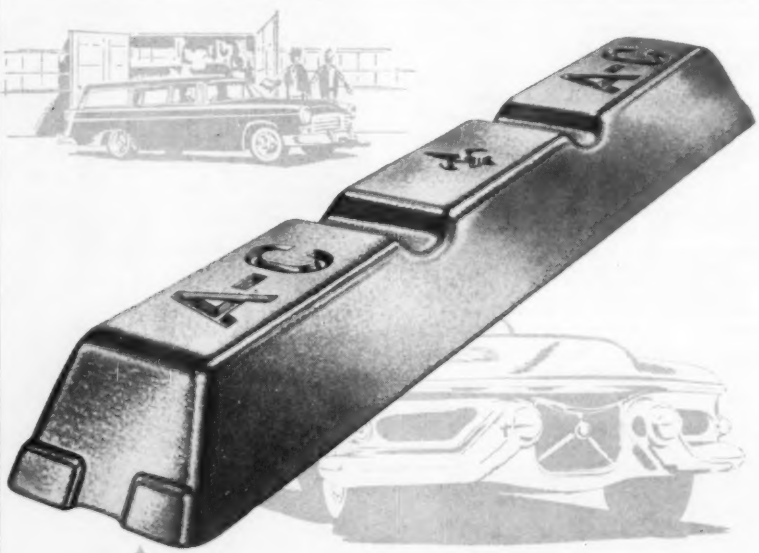

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POWDERED METAL PLANT EXPANDS

Chicago Powdered Metal Products Company of Schiller Park, Illinois, fabricators of powdered metal parts, announced the expansion of their present plant and equipment providing for molding presses up to three hundred tons accommodating large powdered metal parts to 15" in diameter. Cost of expansion is estimated at $150,000.00 and is planned for completion by January 1st, 1958.

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60. Fire-Resistant Hydraulic Fluids—are discussed in the booklet, "Ucon Hydrolubes Spell Safety", from Union Carbide Chemicals Co. The results of laboratory tests and service records are included.

61. Pilot Plant Facilities—A new booklet issued by Westinghouse Electric Corp., entitled "For A Competitive Edge", describes their new metals plant at Blairsville, Pa.

63. Finishing Non-Ferrous Metals—Detailed laboratory and engineering reports, on the finishing of non-ferrous metals by the "Iridite" process, available from Allied Research Products, Inc.

64. Barrel Finishing—A 52-page handbook, from Almco, Div. of Queen Stove Works, Inc., provides a complete description of the most advanced processes.

65. Chromate Treating—Data sheets and prices are offered by The Chemical Corp. on their complete line of Luster-on Powders: zinc, cadmium, copper and brass, aluminum and magnesium.

66. Spray Decorating—Literature is available on mechanical and air operated clamps and pressure fixtures for holding masks and parts in spray decorating. Conforming Matrix Corp.

67. Drilling & Tapping Heads—Data is available on a universal ball joint adjustable spindle for multiple drilling and tapping heads, making over a million different hole combinations possible on any drill press. Ettco Tool & Machine Co., Inc.

68. Double Spindle Lathes—Hammond Machinery Builders have issued a catalog on their line of double spindle lathes, featuring a separate motor, control, and variable speed drive for each individual operator.

70. Metal Finishing—A technical folder is available on Liquimatic; an automatically-applied, fast cutting, liquid compound that gives 25% more buffing efficiency. Hanson-Van Winkle-Muning Co.

71. Finishing—Instructive booklets on barrel-finishing and metal polishing are available from Norton Abrasives.

72. Metal Cleaning—Oakite Products, Inc. has issued a booklet on metal cleaning entitled "Some Good Things to Know about Metal Cleaning."

73. Magnesium Dust Control—The "wet method" of magnesium dust collection and control is the best, according to a brochure from Peters-Dalton, Inc.

75. Die Casting Complicated Shapes—with Tadanac Zinc; an alloy ideal for low temperature high speed operation, is discussed in literature by Consolidated Mining & Smelting Co. of Can., Ltd.

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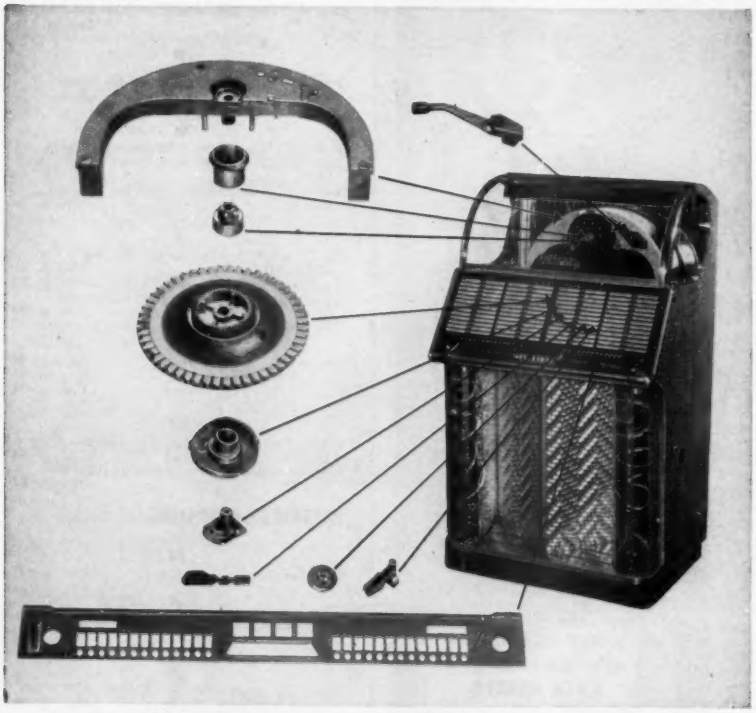

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Joseph S. McVey, Jr., has been appointed Casting Design Engineer for the Everett-Lynn Foundries of General Electric Company's Foundry Department, it was announced recently by A. E. Blake, Manager-Engineering.

JOINS BALDWIN-LIMA

Peter M. DiCarlo, formerly a supervisor of production control with Reed-Prentice Corporation here, has accepted the production control superintendency with the Electronics & Instrumentation Division of Baldwin-Lima-Hamilton Corporation at Waltham. He is president of Worcester Chapter of American Society for Metals.

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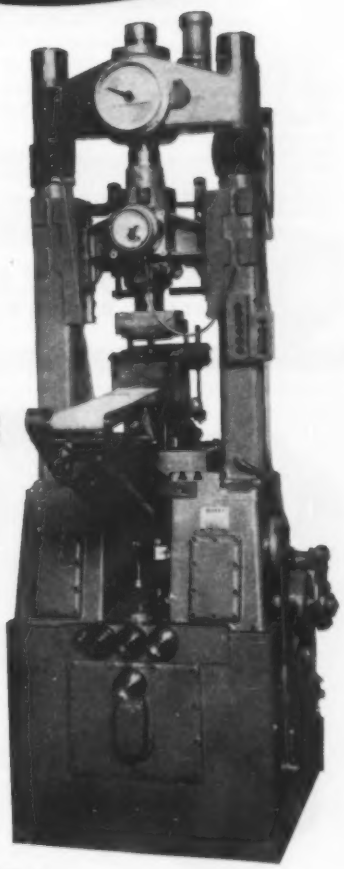

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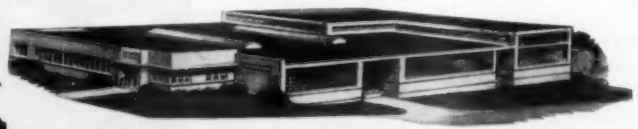

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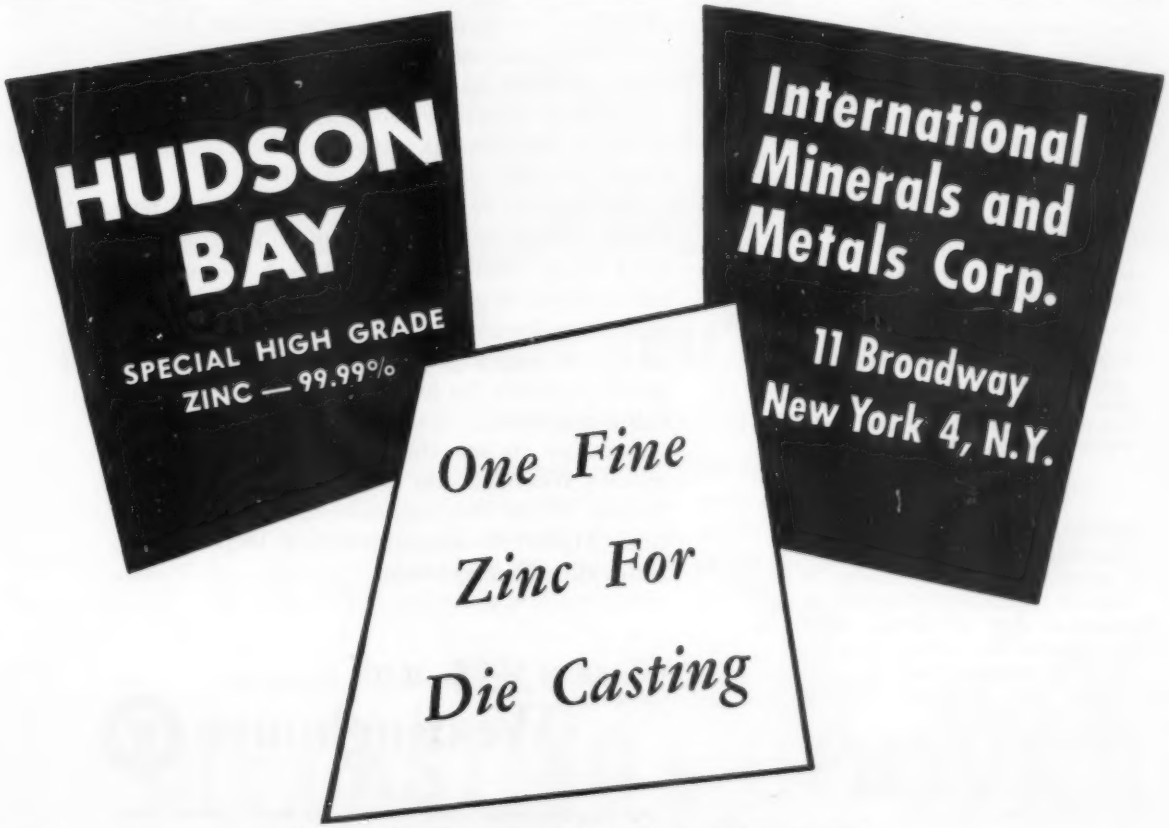
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ENGINEER — with a B. S. degree as a minimum for staff position in Sales Department with large metal producer. Experience in powder metallurgy and/or electronics desirable. Headquarters NYC. Send complete resume and minimum salary requirements. Box No. 10157.

WANTED — Production engineer for powder-metallurgy department, experienced in tool design and estimating, will be needed to assist and train salesmen of large and established metal fabricating firm in Michigan. Excellent opportunity for progress with aggressive growing company. Give complete resume of qualifications, experience and state salary expected. Box No. 12357.

POSITIONS WANTED

POSITION WANTED — Diecasting superintendent. 20 years experience all phases of diecasting, 15 years in supervision, 8 years as sup't. Size and location immaterial. Box No. 12157.

EQUIPMENT

ESTABLISHED MANUFACTURER WOULD LIKE TO PURCHASE A SMALL OR MEDIUM SIZE DIE CASTING COMPANY. WITH, OR WITHOUT, PRESENT MANAGEMENT. PREFER MIDWEST LOCATION. Box No. 12457.

BEAT INFLATION — Use HONESTLY Rebuilt, Modernized Die Casting Machines — equivalent to NEW — at HALF the cost of new. Write Kaul, Pickett, Ziesenheim, c/o The Pilliod Company, Swanton, Ohio

FOR SALE — 2 Lindberg Radiant Fired Electric Furnaces complete with controls, 440 V, 50 KW. Aluminum Match Plate Corp., 1500 Military Rd., Buffalo 17, N. Y.

FOR SALE — One Kux Model BA-12 die casting machine for zinc. Unit is complete with furnace and all controls, also includes air compressor, Schramm Model WD-50. Price $4000. Box No. 12257.

METAL CERAMICS TO PRODUCE PARTS

Metal Ceramics, a division of John E. Skach Tool Co., has announced that powdered metal parts and all the various branches of metal powders will be engineered and produced to customer specifications.

J.E.S.T. Co., specialists for the past thirteen years in powder metal tooling and metallurgy, will now fabricate any part.

ALLOYS AND CASTINGS FOR A COMPETITIVE EDGE

FREE . . . send for your copy of the helpful new Westinghouse booklet, *For a Competitive Edge* (B-6570). It describes how you can keep up with metals advances in the face of increasing investment and rapidly expanding metals science.

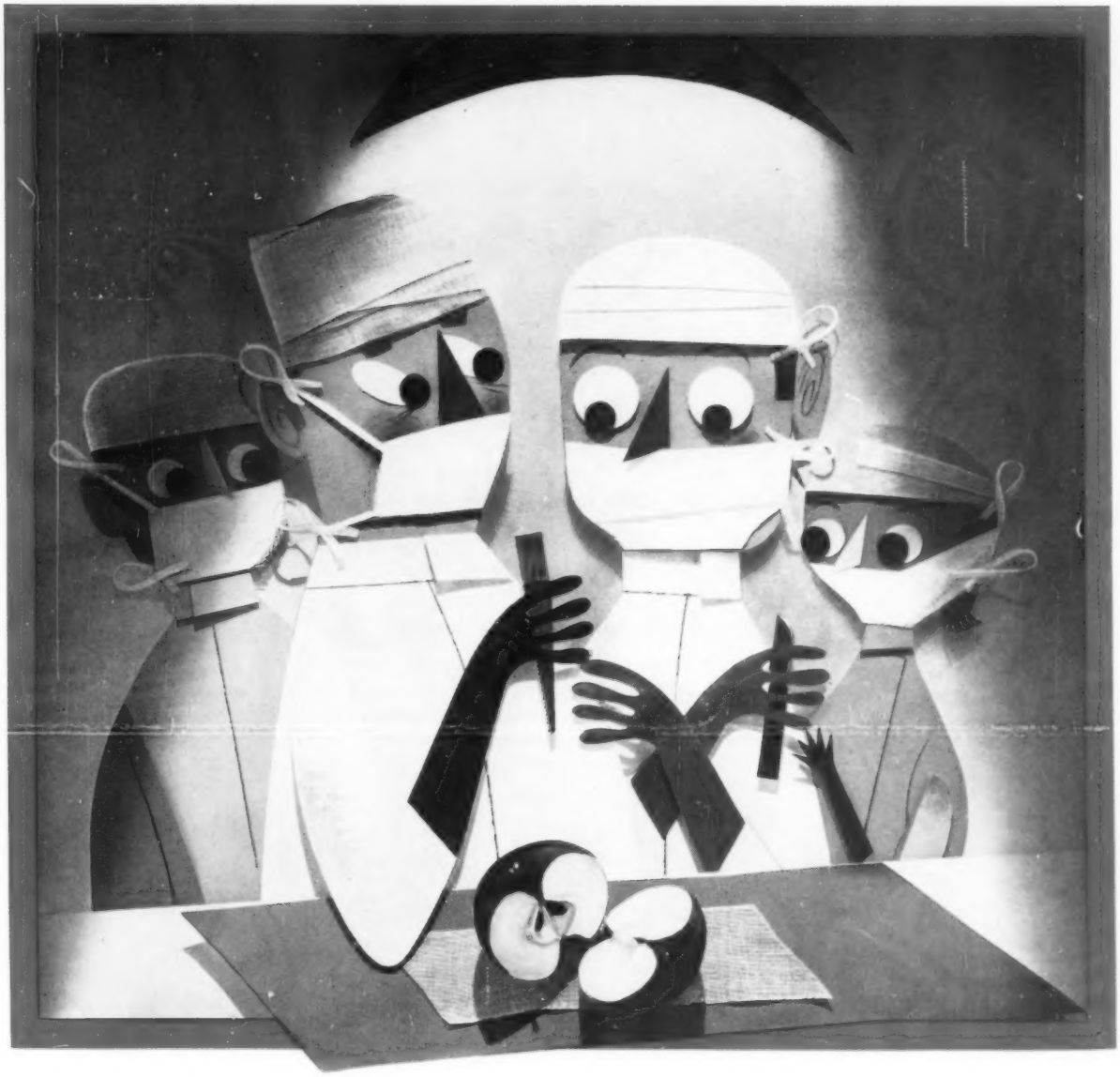
The booklet takes you on a tour of the new Westinghouse metals plant at Blairsville, Pa. Pilot plant facilities here can help you explore full production conditions and create prototype quantities for wrought alloys and molded-metal products. Some production capacity can be made available for fast, dependable delivery of metal products.

Arrange to see the 16-mm, full-color, 22-minute Westinghouse film, *This New World of Metals*. Write Westinghouse Electric Corporation, Materials Manufacturing Department, Blairsville, Pennsylvania. J-05003

YOU CAN BE SURE... IF IT'S

Westinghouse

For more information circle No. 61 on the Reader Service Card



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call a Hoover Man

Some people are exacting about everything they do. Precisely the way we feel about Hoover castings—aluminum and zinc alloy ones, that is. We've been producing precision castings for virtually every major industry in the country for 35 years. Why not try us out? Just get in touch with us and let one of our Sales Engineers give you the whole story.

THE HOOVER COMPANY, Die Casting Division, North Canton, Ohio Die Casting specialists since 1922
In Canada — Hamilton, Ontario

DIE CASTING *by* HOOVER

For more information circle No. 35 on the Reader Service Card

Increase Customer Satisfaction with

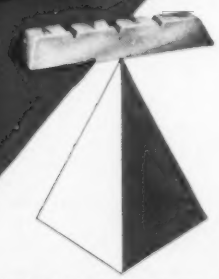
APEX PRODUCTS

ALUMINUM ALLOYS	for all types of castings
ALUMINUM BILLETS	for extrusions
***ALUMINUM**	for steel deoxidizing and grain control
****ALUMINUM BASE HARDENERS**	for alloying and grain refining purposes
GRAINED ALUMINUM	for thermit reductions, steel metallurgy, chemical applications, etc.
ALUMINUM FLUXES	for cleansing and grain refining all alloys
†**MAGNESIUM ALLOYS**	for all types of castings
MAGNESIUM ANODES	for cathodic protection
ZINC ALLOYS	for die castings and metal forming dies
ZINC SLAB (DISTILLED)	for galvanizing and alloying

* Furnished in ingot, rod, shot, piglet, grained and special forms.
** Furnished in ingot and shot.
† Also for alloying purposes.

Technical Services

Spectrographic standards
Metallographic and X-Ray Examinations
Physical and mechanical property tests
Chemical, spectrographic and quantometer analyses
Field Engineering



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For more information circle No. 8 on the Reader Service Card

APEX SMELTING COMPANY

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